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14. ABSTRACT

Project CHECO was established in 1962 to document and analyze air operations in Southeast Asia. Over the years the meaning of the acronym changed several times to reflect the escalation of operations: Current Historical Evaluation of Counterinsurgency Operations, Contemporary Historical Evaluation of Combat Operations and Contemporary Historical Examination of Current Operations. Project CHECO and other U. S. Air Force Historical study programs provided the Air Force with timely and lasting corporate insights into operational, conceptual and doctrinal lessons from the war in SEA.

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PROJECT CHECO SOUTHEAST ASIA REPORT

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PROJECT CHECO REPORT

Contemporary Historical Examination of Current Operations

FORWARD AIRFIELDS FOR TACTICAL AIRLIFT IN SEA (U)

15 JUNE 1970

HQ PACAF

Directorate, Tactical Evaluation

CHECO Division

Prepared by:
LT COL KNOTT, MAJ JOHNSON
MAJ LIPPINCOTT Jr., MAJ SEIG
Project CHECO 7th AF, DOAC

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OFFICE OF THE CHIEF OF STAFF

PROJECT CHECO REPORTS

The counterinsurgency and unconventional warfare environment of Southeast Asia has resulted in the employment of USAF airpower to meet a multitude of requirements. The varied applications of airpower have involved the full spectrum of USAF aerospace vehicles, support equipment, and manpower. As a result, there has been an accumulation of operational data and experiences that, as a priority, must be collected, documented, and analyzed as to current and future impact upon USAF policies, concepts, and doctrine.

Fortunately, the value of collecting and documenting our SEA experiences was recognized at an early date. In 1962, Hq USAF directed CINCPACAF to establish an activity that would be primarily responsive to Air Staff requirements and direction, and would provide timely and analytical studies of USAF combat operations in SEA.

Project CHECO, an acronym for Contemporary Historical Examination of Current Operations, was established to meet this Air Staff requirement. Managed by Hq PACAF, with elements at Hq 7AF and 7AF/13AF, Project CHECO provides a scholarly, "on-going" historical examination, documentation, and reporting on USAF policies, concepts, and doctrine in PACOM. This CHECO report is part of the overall documentation and examination which is being accomplished. Along with the other CHECO publications, this is an authentic source for an assessment of the effectiveness of USAF airpower in PACOM.

ROLAND [illegible] CAMPBELL, Major General, USAF
Chief of Staff

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FOR THE COMMANDER IN CHIEF

Maurice L. Griffith

MAURICE L. GRIFFITH, Colonel, USAF
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a. TAC

(1) HEADQUARTERS
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(2) AIR FORCES
- (a) 12AF
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- (b) 19AF(IN). 1
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- (b) 23TFW(DOI). 1
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- (b) XPX 1
- (c) DM. 1
- (d) IN. 1
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(2) AIR FORCES
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- (a) DOI 1
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(2) AIR FORCES
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- (b) ARRS(XO). 1
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d. ADC

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(2) AIR DIVISIONS
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f. AFLC

(1) HEADQUATERS
(a) XOX 1

g. AFSC

(1) HEADQUARTERS
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(b) XRLW. 1
(c) SAMSO(XRW). 1
(d) SDA 1
(e) CSH 2
(f) DLXP. 1
(g) ASD(ADJT) 1
(h) ESD(XO) 1
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(2) SUBORDINATE UNITS
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k. PACAF

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2. XP. 1
3. DO. 1
(b) Det 8, ASD(DOASD). . 1
(c) 7AF
1. DO. 1
2. DIP 1
3. XP. 1
4. DOCT. 1
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2. XP. 1
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(4) WINGS
- (a) 8TFW(DOEA) 1
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- (c) 35TFW(DOIN). 1
- (d) 56SOW(WHD) 1
- (e) 347TFW(DO) 1
- (f) 366TFW(DO) 1
- (g) 388TFW(DO) 1
- (h) 405FW(DOEA). 1
- (i) 432TRW(DOI). 1
- (j) 460TRW(DOI). 1
- (k) 475TFW(DCO). 1
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- (a) Task Force ALPHA(IN) . . 1
- (b) 504TASG(DO). 1
- (c) Air Force Advisory Gp. . 1

m. USAFE

(1) HEADQUARTERS
- (a) DOA. 1
- (b) DOLO 1
- (c) DOO. 1
- (d) XDC. 1

(2) AIR FORCES
- (a) 3AF(DO). 2
- (b) 16AF(ODC). 1
- (c) 17AF(IN) 1

(3) WINGS
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- (b) 50TFW(DOA) 1
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FOREWORD

Of the nearly 300 airfields in the Republic of Vietnam (RVN) in early 1970, only 138 were used for tactical airlift operations. The widely dispersed airfields were linked by an Air Line of Communications (ALOC) serviced by C-130 Hercules, C-123 Provider, C-7 Caribou, and Australian A-4 Wallaby aircraft. All of the fields could handle C-7s and A-4s, 108 could handle the C-123s, and 75 could handle C-130s.[1/] Free World airlift operations from these fields supplied food, weapons, equipment and ammunition, permitted evacuation of the sick and wounded, and provided mobility for ground troops. In a land where heavy jungle and flooded rice fields isolated many villages and where poor roads, monsoon climate, and diverse topography made supply by other means difficult, airlift provided logistical support for ground forces who operated almost everywhere.

Two previous CHECO reports--"Assault Airlift Operations" and "Tactical Airlift in Vietnam"--described in-country air logistics support from the first U.S. involvement in 1961 through June 1969.[2/] This report covers the period from January 1968 to March 1970 and highlights the difficulties associated with using forward airfields that had minimum or no facilities. By early 1970, 17 of the 138 airfields used for airlift were fully operational, permanently-constructed airdromes.[3/] The other 121 sites were characterized by minimum facilities, unimproved runways and ramps, austere operation, lack of aerial port representation and maintenance support, and poor-to-nonexistent radio communication.

[redacted]

[redacted]

The number of forward airfields did not remain stable during the period of this report, but varied slightly from time to time in consonance with the needs of the tactical situation and the pacification program. Similarly, the operational status of many airfields changed.

The mission of providing tactical airlift and maintaining the ALOC for all Free World forces in RVN was the job of the 834th Air Division (834AD). The division commander was responsible to the Deputy Commander for Air, MACV--the Commander, 7AF--who was the single manager for air operations in SEA. With headquarters at Tan Son Nhut AB, the division had units in all parts of the republic (Figure 1). Its 253 aircraft were distributed among seven unit locations (as of March 1970) to permit responsive, reliable support for the needs of tactical commanders in every region of the country (Figure 2).

The size of the division's job had grown during its sojourn in Vietnam. By 1969, the 834AD was flying some 1,180 sorties daily, with a landing and takeoff occurring somewhere in RVN about every 40 seconds; while nearly 5,000 pounds of cargo, mail, and passengers were airlifted every minute. U.S. and Royal Australian Air Force (RAAF) crews were airborne 35,569 times in 1969, with cargo that ranged from troops to chickens, cement, rice, ammunition, cattle, trucks, and mail.[4/] The scope and nature of the day-to-day operations are suggested by the following figures:[5/]

- A single C-130 airlifted more than 105 tons of aviation fuel in one day, making six round trips in a 12-hour crew day.
- A single C-123 airlifted 43 tons of cargo in one 15-hour crew day.
- One C-123 airlifted 388 troops in a single day.

[redacted]

[redacted]

- In one month, a typical C-123 crew operating out of Da Nang AB flew more than 105 hours and airlifted 1,217,532 pounds of cargo and 1,642 passengers in a total of 244 combat sorties.

Considering that most of the tactical airlift operations were performed at forward airfields, these austere facilities significantly affected the conduct of the war. The purpose of this report is to evaluate the concept of forward airfields and assess the solutions to the problems faced by airlift during the reporting period.

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834TH AIR DIVISION ORGANIZATION CHART

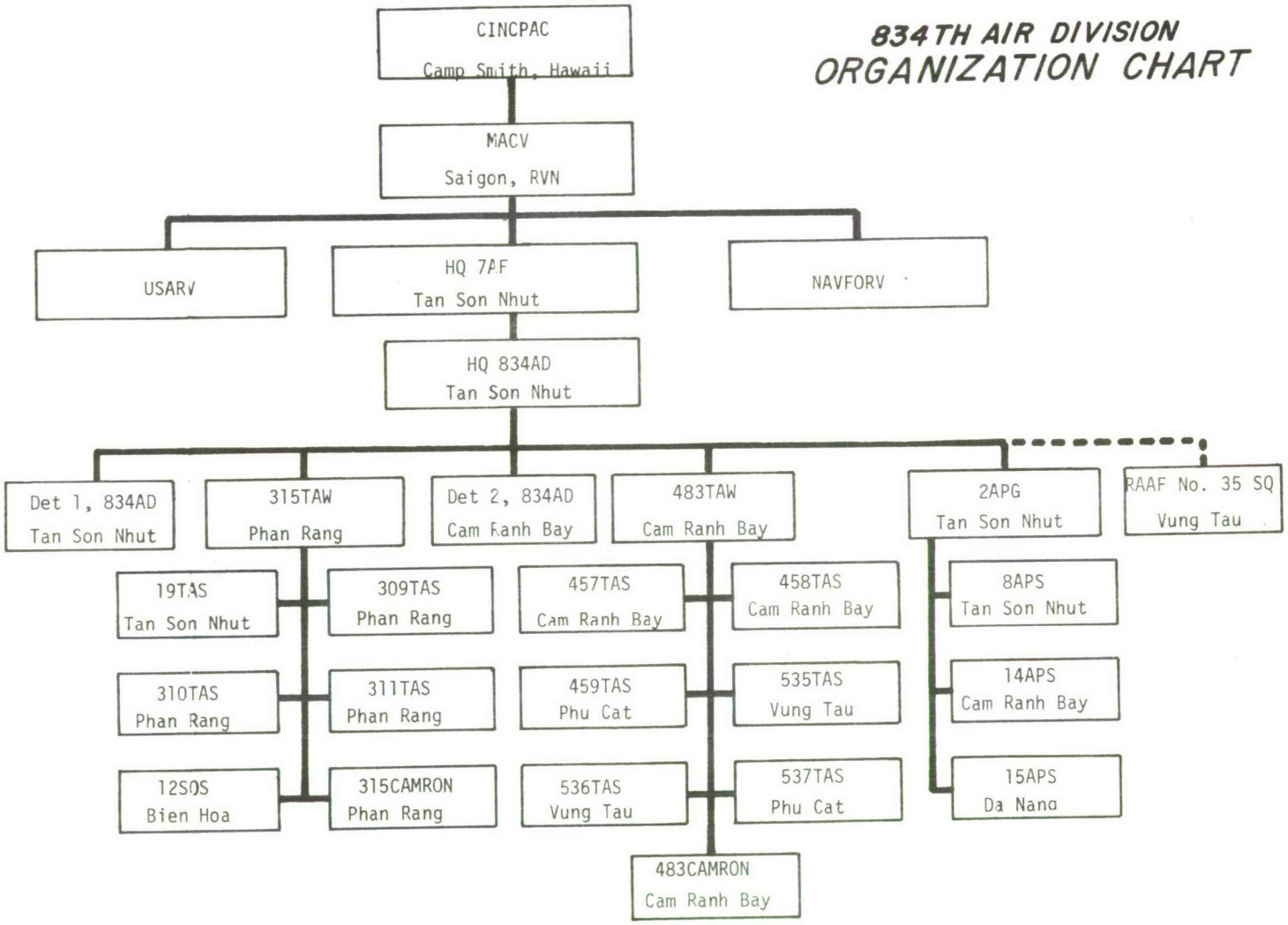


Figure 1

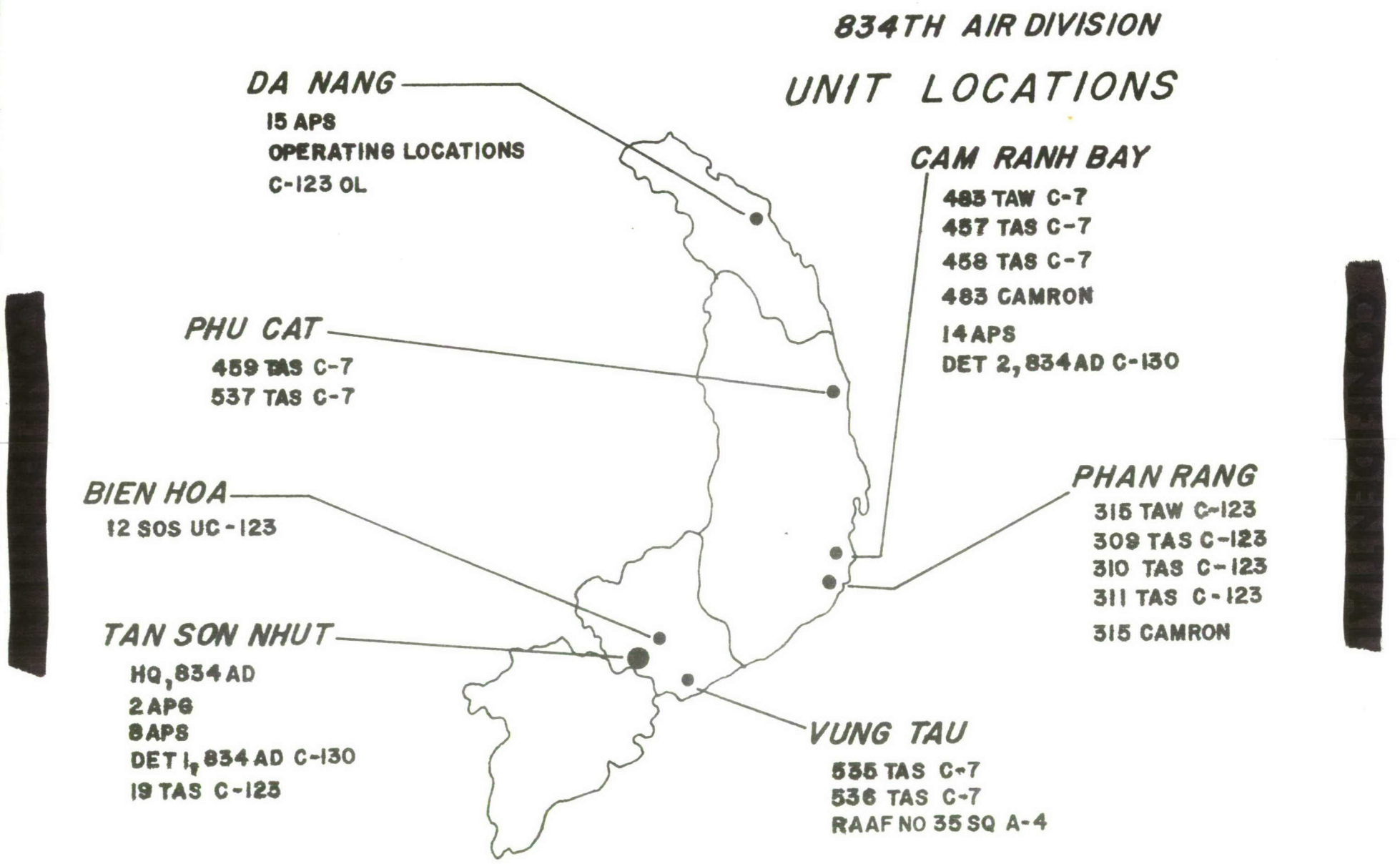

834TH AIR DIVISION
UNIT LOCATIONS
DA NANG
15 APS
OPERATING LOCATIONS
C-123 OL
CAM RANH BAY
483 TAW C-7
457 TAS C-7
458 TAS C-7
483 CAMRON
14 APS
DET 2, 834 AD C-130
PHU CAT
459 TAS C-7
537 TAS C-7
BIEN HOA
12 SOS UC-123
PHAN RANG
315 TAW C-123
309 TAS C-123
310 TAS C-123
311 TAS C-123
315 CAMRON
TAN SON NHUT
HQ, 834 AD
2 APS
8 APS
DET 1, 834 AD C-130
19 TAS C-123
VUNG TAU
535 TAS C-7
536 TAS C-7
RAAF NO 35 SQ A-4

FIGURE 2

CHAPTER I

OPERATIONAL CONSIDERATIONS

The austere configuration of most forward airfields led to a need for strict operational organization and control, the quality of the communications system alone creating a climate of potential aerial hazards to the tactical airlift mission. Significant actions were taken to standardize control procedures; the 834th Air Division established airfield survey activities, the Tactical Airlift Liaison Officers (TALOs) were assigned and in 1968 the Joint Air Operations Group (JAOG) was created as a forum to consider mutual problems of interservice air operations. Although these three activities were not a panacea, they were able to reduce hazards significantly.

AIRFIELD STANDARDS AND CONTROL

MACV Directive 415-9 (Appendix II) established the construction criteria for military airfields to be used by C-7, C-7, C-123, and C-130 aircraft in RVN (Figures 3-5). These criteria were established on the basis of the total tactical airlift mission role; that is, to attain satisfactory support facilities on austere airfields, while retaining maximum flexibility in airfield use. The capabilities of an airfield were determined by its construction features and operational efficiency and were classified into three types: 6/

Type I airfields (minimum operational) had the lowest standard of construction and satisfied only the absolute minimum criteria. Operations into these fields were only marginally safe, inefficient from a

logistics viewpoint, and limited to daylight and good weather. These fields were designed to be used as assault airfields or for routine resupply of small units like Special Forces camps when time was not a critical factor. Runway surfaces--clay, laterite, limestone, light steel matting (M8A1), or sod, depending on the aircraft involved--were expected to sustain 700 traffic cycles (takeoff and landing) without major repair (Figure 6).

Type II airfields (limited operational) incorporated only the minimum amount of construction required for sustained operations, but possessed the capability of being expanded for operations in bad weather and at night. This capability included lighting and instrument approaches, the terrain permitting. The ramp capacity was sufficient to hold at least three of the largest aircraft for which the field was designed. Runway surfaces were capable of sustaining 4,000 traffic cycles without major repair and ranged in nature from cinders and aluminum matting to cement and asphaltic-concrete, depending on aircraft type.

Type III airfields (fully operational) were built to support continual 24-hour operations under all weather conditions. These airfields provided complete services, including refueling, base operations, weather advisories, transient alert, 24-hour messing, control tower, and transient ramp space for at least three aircraft of the largest size authorized use of the field. Ideally, runway surfaces were asphaltic-concrete or rigid-concrete, capable of sustaining 15,000 traffic cycles without major repair.

C-130 Hercules. Before the C-7s arrived in SEA, C-130s handled mre than two-thirds of all airlift, a Hercules carrying a maximum of 36,700 pounds of cargo or 92 fully-equipped troops.

FIGURE 3

C-123 Provider. Capable of hauling 15,000 pounds of cargo or 60 fully-equipped troops, a C-123 is shown taking off from a laterite runway with a thin peneprime surface.

FIGURE 4

C-7A Caribou. An all-weather, short takeoff and landing (STOL) utility transport, the Caribou could carry as many as 32 troops or more than 6,000 pounds of cargo and operate from unimproved strips.

FIGURE 5

A Caribou lands on the 1,400-foot clay peneprimed runway at Dak Seang, RVN. Traffic was restricted to one aircraft on the ground at a time. The field was not normally used when wet.

FIGURE 6.

As the capabilities of an airfield varied, its classification changed, with deterioration being the most frequent cause of a reduction in an airfield's capabilities. Since this was the result of either use and/or weather, a day-to-day evaluation of an airfield's capabilities was accomplished by the 834th AD airfield survey activity.

Figures 7 to 10 show the airlift airfields in operation in late 1969 and early 1970. In 1965 there had been 13 fully operational (Type III) airfields; in 1970, there were the following 17:

Airfield	Corps	Airfield	Corps
An Khe	II	Phan Rang	II
Bien Hoa	III	Phu Cat	II
Binh Thuy	IV	Pleiku	II
Cam Ranh Bay	II	Quang Tri	I
Chu Lai	I	Qui Nhon	II
Da Nang	I	Tan Son Nhut	III
Hue Phu Bai	I	Tuy Hoa	II
Long Thanh North	III	Vung Tau	III
Nha Trang	II		

For purposes of this report, all other airstrips shown in the figures are forward airfields.[7/]

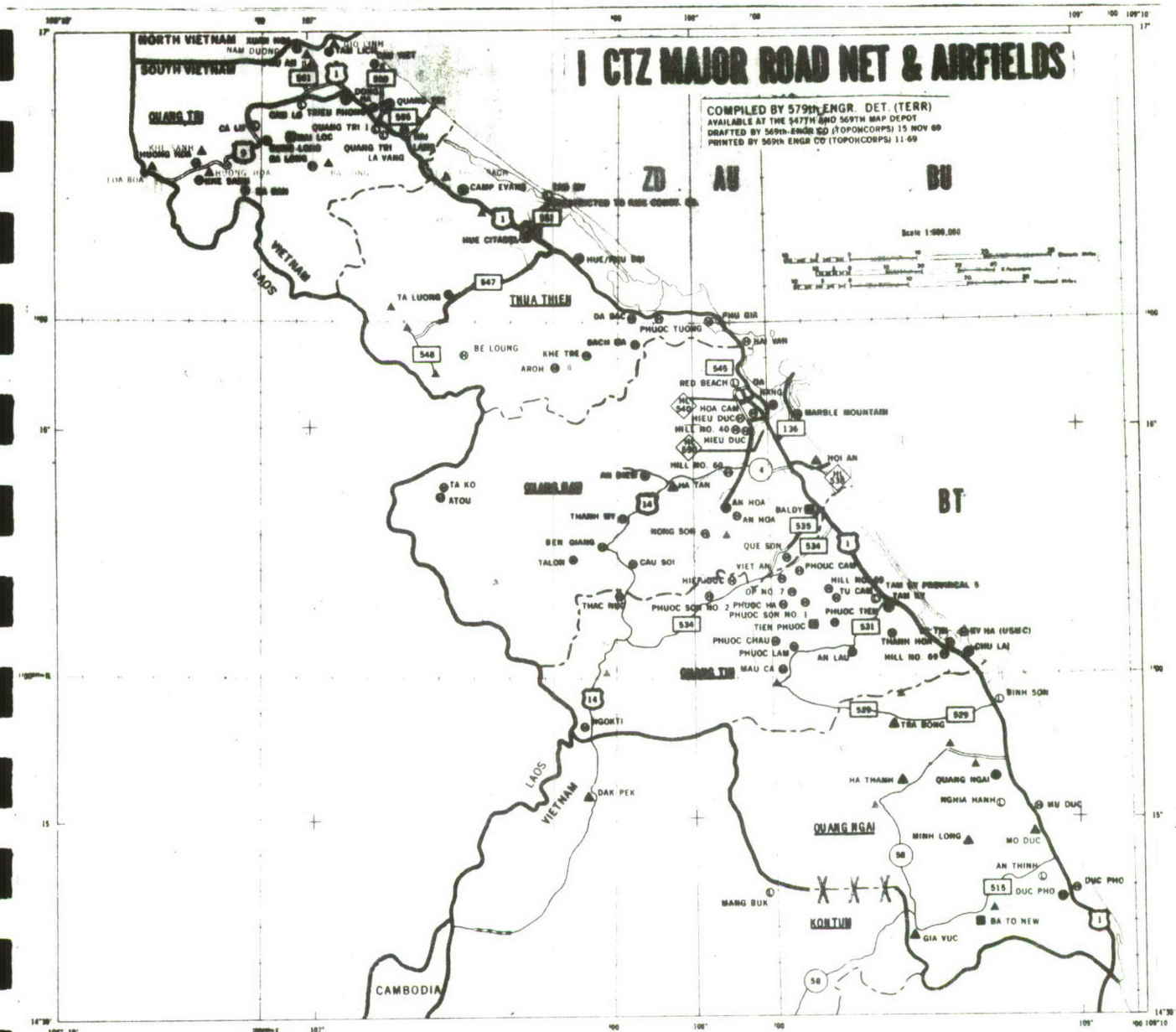
The open, closed, and abandoned categories and symbols in the figures portray forward airfield sites far in excess of the 121 featured in this report. Most of these other airfields, whatever their depicted status, could quickly be made active airfields to meet the demands of changing tactics. The proliferation and dispersal of the airfields facilitated

flexible logistics support for the ground forces and gave them a high degree of battlefield mobility.[8/]

Despite clear standards for the categories of airfields, deviations from the criteria were the rule rather than the exception. The scope of this problem was clearly shown in the 1969 MACV "Listing of Airfield Exceptions to Criteria" (Appendix I). Every Type I and II forward airfield in use at the time was included on the list, and each field required multiple waivers to the MACV standards, which were themselves considered "minimum essential." The conditions listed in the waiver were typical of the normal operating environment for in-country tactical airlift aircraft.[9/]

In March 1970, Brigadier General John H. Herring, Jr., Commander, 834AD, said that "the condition of many of the forward airfields is one of the most serious limiting factors for fixed-wing tactical airlift operations. A goodly percentage of the airfields in which we operate are at best less than desirable."[10/]

The attempt to keep forward airfields in operation and safe was a major concern of airlift commanders from the initial stages of the conflict. The problem was complicated by the multi-faceted jurisdictions and interests of combined and joint commands. A proliferation of regulations and directives covered forward airfield activities, operations, and upkeep.[11/]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TA LUONG
BE LOUNG
KHE TRE
AROH
PHUOC TUONG
DA NANG
RED BEACH
MARBLE MOUNTAIN
HOA CAM
HIEU DUC
HILL NO. 40
HILL NO. 60
NOI AN
AN HOA
BALDY
NONG SON
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VIET AN
PHUOC CAM
TU CAM
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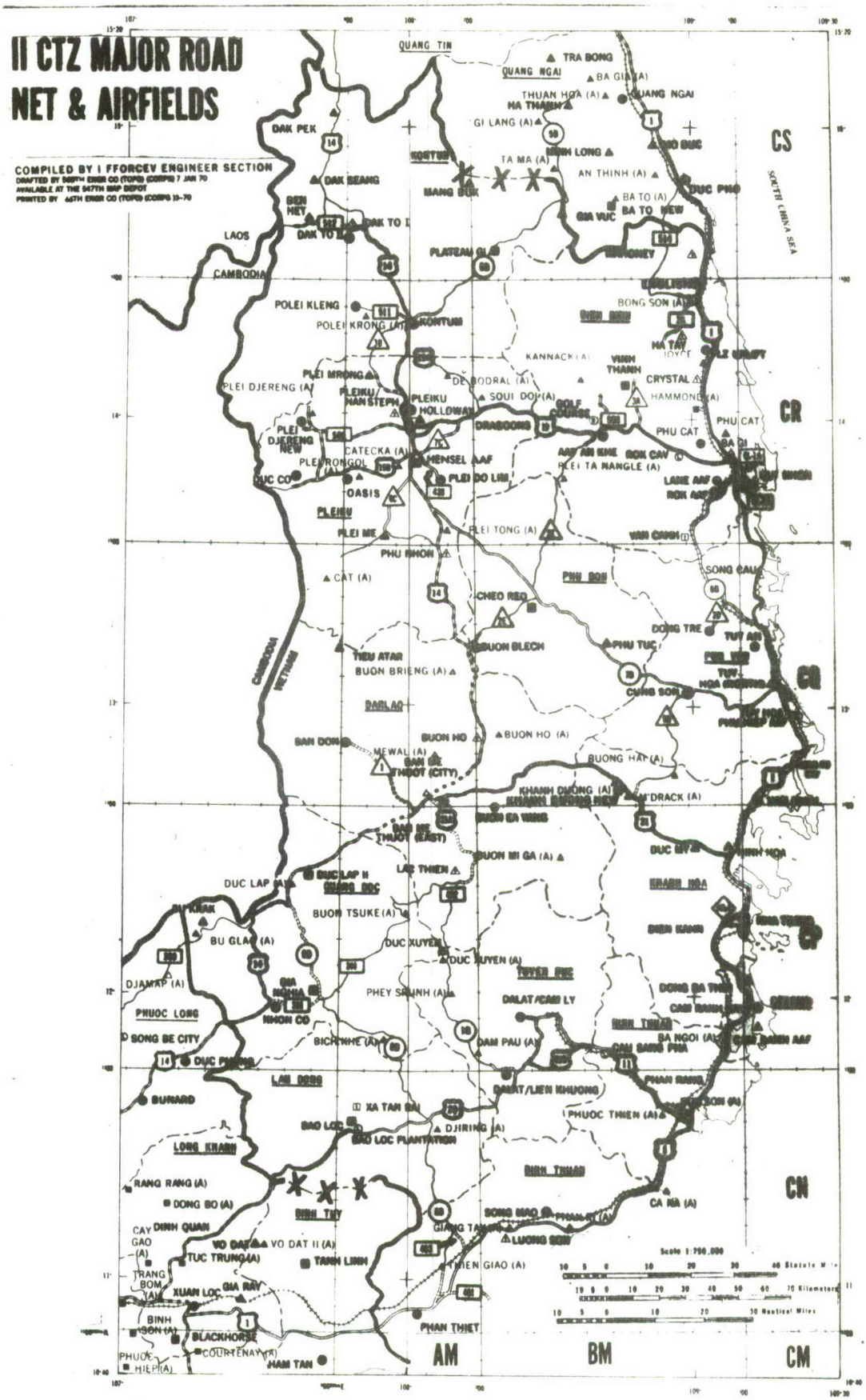
AN THINH
DUC PHO
MANG BUK
KONTUM
BA TO NEW
GIA VUC
ROAD SURFACE
HIGH STANDARD ROAD
CLASS 2A ROAD
CLASS 1B ROAD
CLASS 3 ROAD
STATUS OF ROAD NOT KNOWN OR CLOSED
NATIONAL ROUTES (NR)
INTERPROVINCIAL ROUTES (IPR)
PROVINCIAL ROUTES (PR)
SUPPLEMENTARY ROUTES (SPR)
COMMUNAL ROUTES (CR)
AIRFIELDS
C-130 OPEN
C-130 CLOSED
C-123 OPEN
C-123 CLOSED
C-7A OPEN
C-7A CLOSED
ABANDONED AIRFIELD
LIGHT AIRCRAFT HELIPAD
MAJOR HELIPORT
OTHER FEATURES
INTERNATIONAL BOUNDARY
PROVINCE BOUNDARY
PROVINCE NAME
BIEN HOA

Figure 7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GIA VUC
DAK PEK
DAK SEANG
BEN HET
DAK TO
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PLEI DJERENG (A)
PLEIKU/ MAN STEPH
PLEIKU HOLLOWAY
DE BODRAL (A)
SOUI DOI (A)
DRAGOONS
GOLF COURSE
PHU CAT
PLEI DJERENG NEW
CATECKA (A)
PLEI RONGOL (A)
HENSEL AAF
PLEI DO LIM
AAF AIR BASE
ROK CAV
PLEI TA NANGLE (A)
DUC CO
OASIS
PLEIKU
PLEI ME
PLEI TONG (A)
PHU NHON
CAT (A)
CHEO RED
PHU BON
SONG CAU
DONG TRE
TUY AN
TUY HOA
CUNG SON
THIEN ATAR
BUON BRIENG (A)
BUON BLECH
PHU TUC
DARLAC
BUON HO
BUON HO (A)
BAN DON
MEWAL (A)
BAN ME THUOT (CITY)
BUONG HAT (A)
KHANH DUONG (A)
M'DRACK (A)
BAN ME THUOT (EAST)
BUON MI GA (A)
DUC LAP
DUC LAP II
LAC THIEN
KHANH HOA
BUON TSUKE (A)
BU KRAK
BU GLAO (A)
DUC XUYEN
DUC XUYEN (A)
TUYEN DUC
DJAMAP (A)
PHEY SRUNH (A)
DALAT/CAM LY
PHUOC LONG
SONG BE CITY
NHON CO
BICH NHE (A)
DAM PAU (A)
DUC PHONG
LAM DONG
BUNARD
DALAT/LIEN KHUONG
XA TAN BAI
PHUOC THIEN (A)
BAO LOC
DJIRING (A)
BAO LOC PLANTATION
LONG KHANH
BINH THUAN
RANG RANG (A)
DONG BO (A)
BINH THO
CA NA (A)
CAY GAO (A)
DINH QUAN
VO DAT
VO DAT II (A)
TUC TRUNG (A)
TANH LINH
THIEN GIAO (A)
LUONG SON
TRANG BOM (A)
XUAN LOC
GIA RAY
BINH SON (A)
BLACKHORSE
COURTENAY (A)
PHUOC HILP (A)
HAM TAN
PHAN THIET
CS
CR
CB
CP
CN
AM
BM
CM
SOUTH CHINA SEA
CAMBODIA
VIETNAM

Figure 8

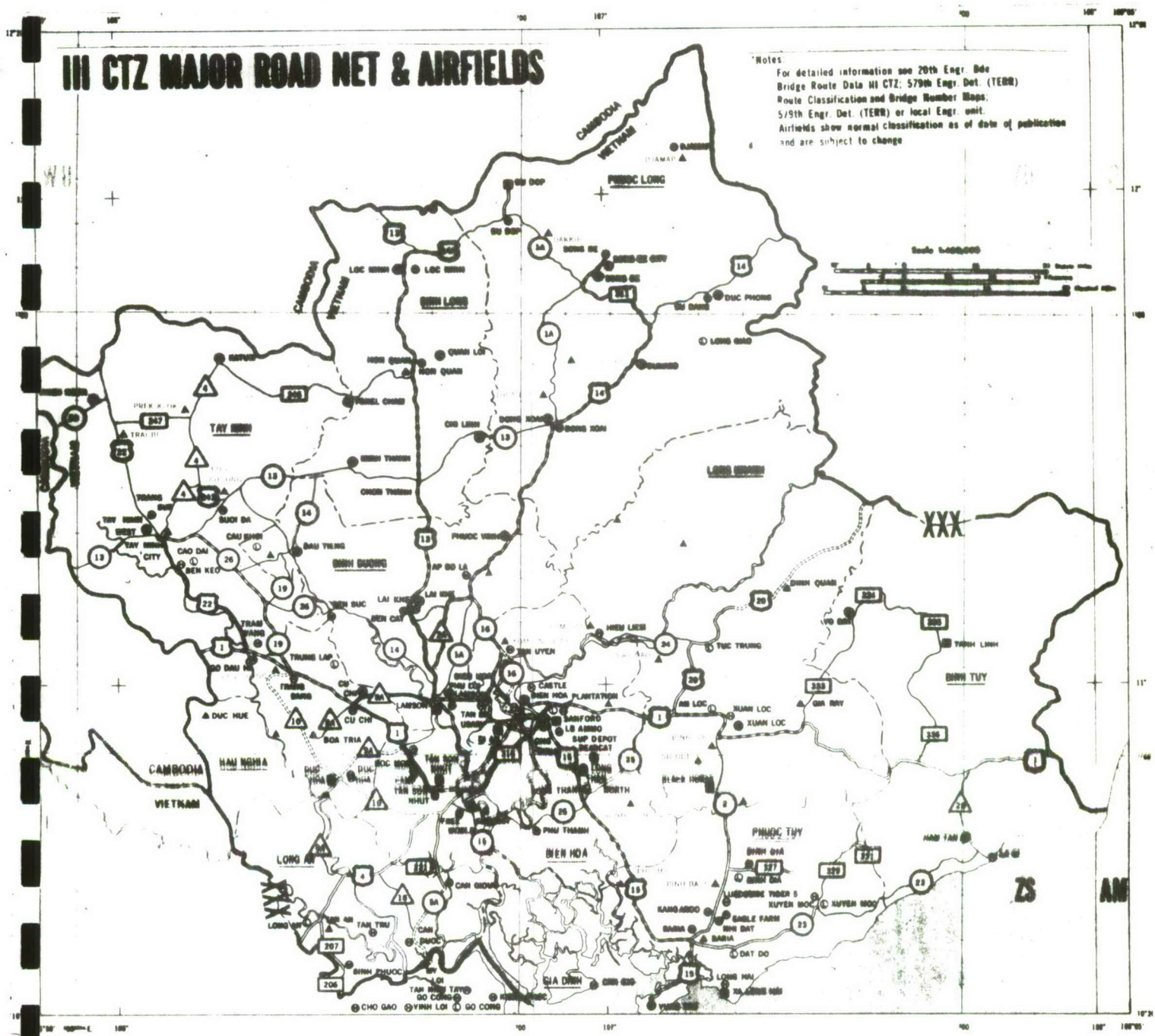

III CTZ MAJOR ROAD NET & AIRFIELDS
Notes:
For detailed information see 20th Engr. Bde
Bridge Route Data III CTZ; 579th Engr. Det. (TERR)
Route Classification and Bridge Number Maps;
579th Engr. Det. (TERR) or local Engr. unit.
Airfields show normal classification as of date of publication
and are subject to change
CAMBODIA
VIETNAM
PHUOC LONG
BINH LONG
TAY NINH
BINH DUONG
BIEN HOA
LONG AN
HAU NGHIA
PHUOC TUY
BINH TUY
LONG KHANH
XUAN LOC
BIEN HOA
SAIGON
GIA DINH
CHO GAO
VINH LOI
GO CONG
DAT DO
BARIA
XXX
ZS
AM

Figure 9


IV CTZ MAJOR ROAD NET & AIRFIELDS
CAMBODIA
VIETNAM
KIEN PHONG
CHAU DOC
AN GIANG
KIEN GIANG
BA XUYEN
VINH LONG
PHONG DINH
CHUONG THIEN
BAC LIEU
AN XUYEN
DAO PHU QUOC
HA TIEN SOUTH
HONG CHONG
BACH GIA CITY
TAN AN
LONG XUYEN
CAO LANH
SA DEC
VINH BINH
BINH DAI
LONG TOAN
SOC TRANG
KE SACH
DUC LONG
LONG MY
LONG PHU
KIEN LONG
TAN PHU
PHUOC LONG
PHU LOC
BAC LIEU
VINH CHAU
GIA RAI
QUAN LONG CITY
SONG ONG DOC
TAN HUNG
DAM DOI
CAI NUOC
SINH HUNG
COMPILED BY 879th ENGR. DET. (TERR)

Figure 10

Most airfields in RVN were under the control of one or another of three Government of Vietnam (GVN) agencies--the Directorate of Air Bases (DAB), the Vietnamese Air Force (VNAF), or the various province administrations. Some airfields were under the control of private individuals. In any case, conditions for use and operation of airfields and airspace by U.S. Forces were established by memorandums of agreement between U.S. authorities and GVN officials.[12/]

MACV Directives 420-1 and 95-5, covering airfield operation and maintenance respectively, prescribed criteria, procedures, and responsibilities for operating, maintaining, and repairing airfields in support of military operations in RVN. These regulations also specified airspace and air traffic control agreements to be made with the RVN Director of Civil Aviation. Being separate from flight facilities, airfield maintenance required special agreements.

Upon obtaining agreement to build or use an airfield, MACV designated a "predominant user" from among its component commands--Seventh Air Force, U.S. Army Vietnam, III Marine Air Wing, and Naval Forces Vietnam. In turn, the predominant user designated a "responsible agency" under its command--such as an Air Force wing or group, an Army division or brigade, or a Marine air group or squadron. The responsible agency then

designated "responsible officers" to coordinate and control airfield operations. Depending on the nature of the operation, the amount of air traffic, or the size of the airfield, responsible officers were called "airfield coordinators," "air commanders," or "airfield control officers."[14/]

The complexity, confusion, and difficulties suggested in Figure 11 frustrated airlift and ground commanders alike. In his end-of-tour report, Major General Burl W. McLaughlin, 834AD Commander from November 1967 to June 1969, wrote that positive control over large numbers of aircraft had been a continual problem--one compounded by involvement of all U.S. services, various Free World Military Forces (FWMF), and civilian agencies such as Air Vietnam and Air America.[15/] He summed up:[16/]

> *"Limited real estate available for airstrips, the fluid tactical situation, remoteness of the forward locations, and finite engineer capability, coupled with competing priorities between airfields and the air and ground lines of communication, are but a few of the factors impacting on airlift support."*

One critical difficulty which arose with the growth of the ALOCs within RVN was the confusion over who was responsible for operations at a given airstrip, especially those at the forward locations. As a result,

UNCLASSIFIED

Figure 11

FORWARD AIRFIELD MANAGEMENT

AIRFIELD OPERATIONS

DAB | RVNAF | PROVINCE | PRIV IND

LETTER OF AUTHORIZATION FOR US TO USE AIRFIELDS*

MACV

DESIGNATES PREDOMINANT USER COMPONENT**

7 AF | USARV | III MAF | NAVFORV

DESIGNATES RESPONSIBLE AGENCY

AF	ARMY	MARINE	NAVY
WG, GP, SQ,	DIV, BDE, GP, ADV TEAM	AIR GP, AB SQ,	AIR SPT ACTY

DESIGNATES RESPONSIBLE OFFICER**

AFLD COORDINATOR | AIR COMMANDER | AFLD CONTROL OFF

* IF US USE OF AIRFIELD IS INFREQUENT, ONLY A VERBAL AGREEMENT IS NECESSARY.

** SEE GLOSSARY.

AIRFIELD SERVICES

LETTERS OF MEMOS OF AGREEMENT OF UNDERSTANDING

AIR TRAFFIC CONTROL	AIRFIELD MAINTENANCE	FLIGHT/AIRFIELD FACILITY UTIL.
PREDOMINANT USER/DCA	MACV OR PREDOMINANT USER/DAB	AIRFIELD USER/RESPONSIBLE AGENCY

CONTROL OF AIRSPACE AND ATC

DCA

AGREEMENTS REQUIRED

AIRSPACE | ATC

AIRFIELD MAINTENANCE AREAS

ARMY COMPONENT COMMANDER	NAVY COMPONENT COMMANDER	AF COMPONENT COMMANDER
II CTZ III CTZ DMAC CMD	I CTZ	DESIGNATED WHERE AF HAS PRIMARY MISSION REQUIREMENTS

UNCLASSIFIED

problems caused by safety hazards, local air traffic control procedures, and other airfield difficulties were slow in being solved, if they were solved at all. Brigadier General William G. Moore, Jr., 834AD Commander from October 1966 to November 1967, sought to solve these and related problems by establishing a Tactical Airlift Liaison Officer (TALO) system as a link between the airlift user and the airlift operator. The TALOs drew attention to the limitations and needs of the various forward airfields in addition to assisting in airlift planning functions and assuring that valid requirements were established.[17/]

On paper the TALOs were assigned within Tactical Air Control Parties (TACPs) located with the ground unit to which they were assigned at corps, field force, division, brigade, cavalry squadron, and battalion levels. This organization satisfied Air Force doctrine requirements that airlift representatives be made subordinate to the senior Air Force Liaison Officer. The TALOs, however, still remained under the operational command and control of the 834th AD (see Figure 12).

The TALOs' functions were many and varied. They were the chief planners and the experts on all airlift matters at the forward airfields. Brigadier General Herring, the 834 Air Division in 1970, used the TALO as his eyes and ears in the field and regarded him as his personal representative. The TALO was active in every facet of forward airfield operation, from initial planning through final evacuation. Each airfield in the TALO's assigned area was inspected at least once a month, or as frequently as use and weather conditions dictated. Alert for any

hazards or items that could deleteriously affect safety, his evaluations were considered adequate justification for continuing or halting airfield operations as directed by the Airfield Survey Activity. He was the airlift link between the Army and Air Force.[13/]

JOINT AIR OPERATIONS GROUP

Despite the gains and improvements made possible by the TALO system, some problems required expeditious,multi-service discussion and resolution at the highest level. In August 1968 General McLaughlin started informal talks with the U.S. Army Vietnam (USARV) Aviation Officer, Major General Robert R. Williams, Commander, 1st Aviation Brigade, which led to the formation of the Joint Air Operations Group (JAOG) in September 1968. By April 1969, MACV had formalized the group, stating its mission in MACV Directive 95-15: "to identify and resolve mutual problems in the U.S.Army, U.S. Air Force, U.S. Marine Corps, and U.S. Navy air operations, with particular focus on operations at forward airstrips and established joint-use airfields."[19/] The directive established the group as shown in Figure 13. The chairman, a general officer, represented the USARV Deputy Commanding General, the 7AF Commander, or the III Marine Air Wing Commanding General, on an alternating, quarterly basis.

The major categories of special interest to the JAOG were airspace and airfield management, air traffic control, airfield traffic control, airfield hazards, artillery air warning systems, flight information procedures, and related problem areas.[20/] The combined effort of the major airfield users sought solutions to persistent maintenance and

834th AIR DIVISION

"TALO" ORGANIZATION AND LOCATION

APRIL 1970

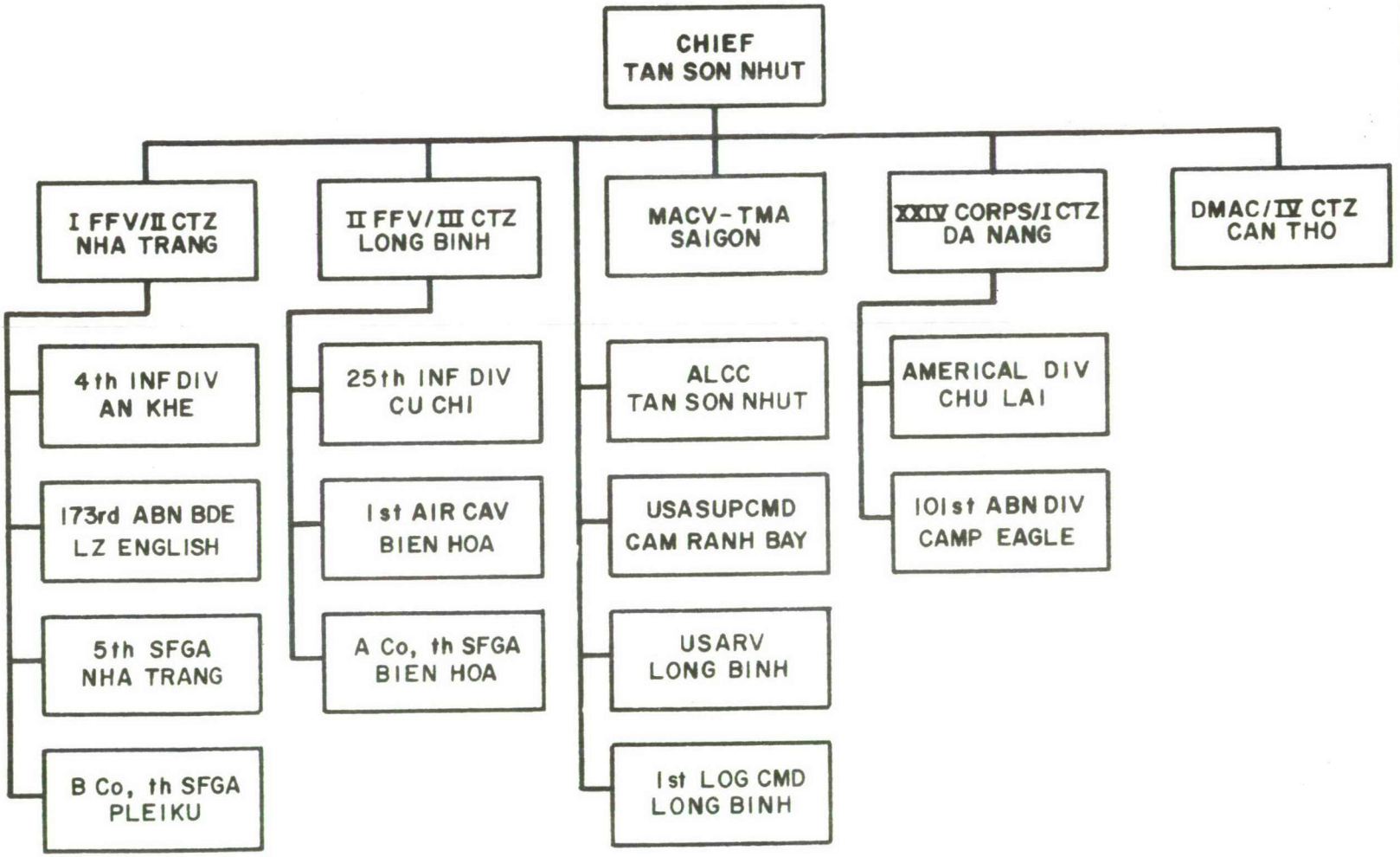


Figure 12

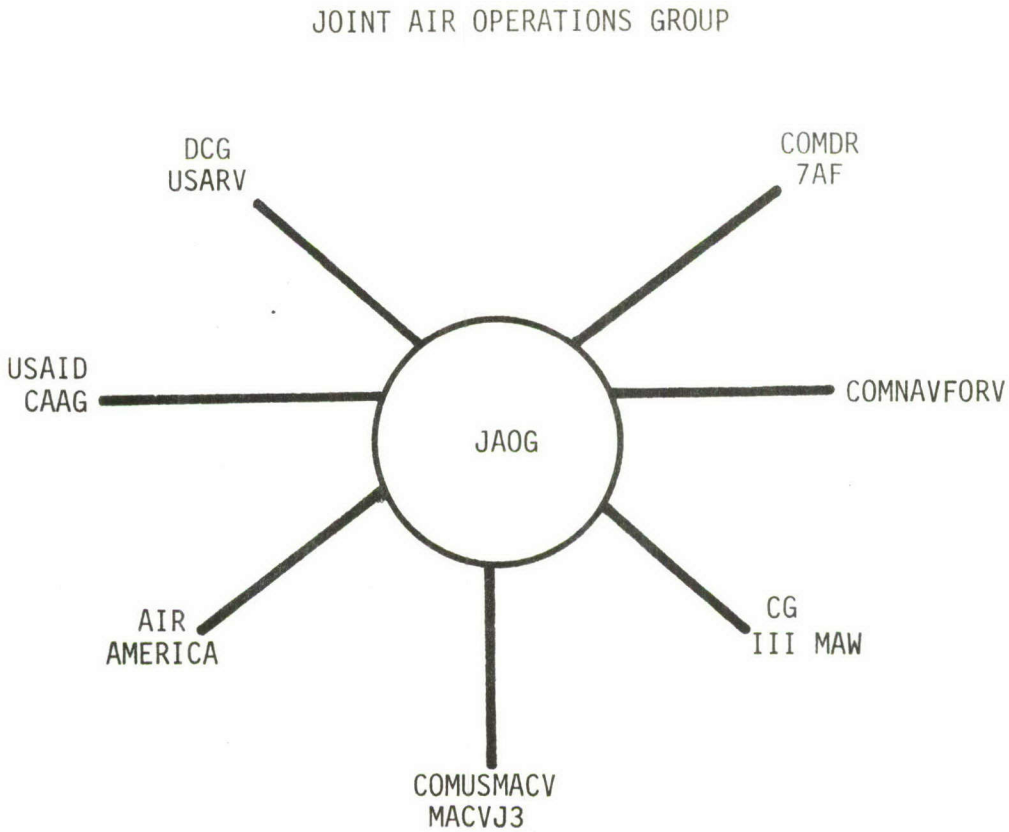


FIGURE 13. Permanent members of the Joint Air Operations Group (JAOG). Other participants joined the group's proceedings on invitation or by request.

control problems, such as:

- Coordination of artillery firing and overhead movement of friendly aircraft.
- Uncontrolled aircraft traffic on and near the active runway.
- Fixed-wing aircraft penetrating helicopter landing patterns, and both types of aircraft landing and taking off without tower contact, as well as standard approach patterns.
- Hazards, such as bunkers and revetments, within lateral clear areas.
- Uncontrolled ground traffic, both vehicular and pedestrian.

In general, the problems the JAOG faced came from saturation of limited airspace and the confusion of responsibilities in the tasks of operating and maintaining forward airfields.[21/] To meet its objectives of problem identification and solution, the JAOG organized five permanent committees or working groups: Air Traffic Control, Artillery Warning, Airfield Facilities, NOTAMs, and Education. Each group consisted of representatives from those military services which might be affected by solutions to particular problems.[22/]

One of the most significant JAOG actions affecting forward airfields was the specification of lateral and vertical separations for traffic at joint-use fields. Prior to this JAOG action, the possibility of a mid-air collision had presented more of a hazard than hostile enemy fire in many areas of high-density traffic in RVN, especially at forward airfields.[23/] Traffic patterns for fixed/rotary-wing aircraft, developed at the local level, were forwarded to USARV and 7AF for review. Once approved, the patterns were published in the Tactical Aerodrome Directory, used by

both the Army and Air Force, which contained information on all active airfields in-country. Rotary and fixed-wing patterns were overprinted on a photograph of the field or were shown in a schematic drawing. When feasible, fixed-wing traffic and rotary-wing traffic were restricted to opposite sides of the field. For vertical separation, fixed-wing traffic flew at a minimum of 1,000 feet above the ground and rotary-wing traffic flew at a maximum of 500 feet. Unless an aircraft received clearance from the control tower, exceptions to the rule were permitted only to avoid terrain, hostile fire, or artillery firing areas. Small, slow fixed-wing aircraft were exempt from these restrictions because of their low speed.[24/]

When a forward location was opened and no pattern had as yet been published, fixed-wing aircraft flew a lefthand pattern at a minimum of 1,000 feet, while rotary aircraft flew a righthand pattern at a maximum of 500 feet. At airstrips without specific control, all U.S. service pilots monitored one of two approved in-country common frequencies. Pilots landing or taking off at uncontrolled strips broadcast their intentions on both frequencies, in order to alert other aircraft in the area. Air America also announced two frequencies for common use; one was used in common with USAF and the other could be monitored to learn of Air America pilots' intentions. When helicopters were operating on or close to a runway or were not under positive tower control, airlift aircraft did not attempt to land or take off. At forward airstrips, airlift pilots did not land or take off unless they first established

[redacted]

radio contact with any helicopter pilots in the immediate vicinity. In either case, the airlift pilots held over the field no longer than one-half the time they were scheduled to be on the ground before proceeding with alternate routing. The 834AD Airlift Control Center scheduled other aircraft to pick up the load wherever the plane landed.[25] The compromise between efficiency and safety was pointed out by a former commander of the Division's Detachment 1:[26]

> *"There can be and should be separate criteria for operations into substandard airfields. The criteria should be determined by the priority of the mission. The maximum allowable landing gross weight, which should be adjusted downward, will cause some degradation in efficiency; however, through proper planning and improved loading/refueling procedures, this loss of efficiency can be reduced to acceptable conditions."*

One successful fallout from the JAOG was the establishment of a briefing team from USARV and the 834AD to visit all major ground force units. The team briefed on Army responsibilities for airfield operations, highlighted the hazards which needed to be eliminated, brought supervisors up-to-date on new policies and procedures, and promoted active discussion and participation in eliminating hazards wherever they were discovered. Additionally, the team identified problem areas which required additional assistance by the AD Headquarters.[27]

Another valuable and timely tool was the Report of Airfield Discrepancy (ROAD) Report. Aircrews were in a unique position to report on the status of airfields, especially in areas not covered by the airfield folder or the Tactical Aerodrome Directory. Any time crews found hazards to safe operations--such as bunkers, vehicles, cargo, or helicopters too close to the

[redacted]

[redacted]

runway, they were expected to call the Airlift Control Center by radio or any other means. Prefixing the message with the code-word "ROAD Report" triggered immediate response, and the 834AD contacted the owning agency to see that deficiencies were corrected as quickly as possible. If necessary, the airfield was closed to 834AD aircraft until the hazard was corrected.[28/] Headquarters USAF granted a waiver to AFM 55-13 to allow expansion of the NOTAMs to include a variety of information on airfield status that would not normally have been allowed in non-combat areas.[29/]

TACTICAL AIRLIFT

The withdrawal of U.S. forces from RVN in the first half of 1970 did not noticeably reduce the requirement for airlift. In fact, there were instances of significant increases in requirements. The reduction of U.S. Army and U.S. Navy forces included a reduction in surface transportation units and surface convoy capability. The reduced remaining combat force required increased mobility to react to enemy thrusts and probes. The reduction in U.S. forces was offset to some extent by increases in Vietnamese forces; but, under the Improvement and Modernization program, the Vietnamese were not scheduled for significant airlift capability to support their ground forces until after December 1971. In the meantime, the void was to be filled by USAF tactical airlift.[30/]

Because tactical airlift requirements did not decrease at the same rate as the reduction in total U.S. forces, there was an effort to increase

[redacted]

the productivity of the total force on hand. One of the most significant obstacles to this, however, was the deterioration of forward airfields, which limited use of the larger airlift planes. Runway deterioration restricted some fields to use by C-7s, in IV Corps. Since the load-carrying capability of the C-7 was many times less than that of the C-130, a high demand for C-7s resulted. It could not always be met, however, because the system of providing dedicated aircraft to ground force users left very few C-7s for employment in the Common Service Airlift system. The scope of the problem can be deduced from Figures 14 through 19, which show the number of Type I fields in RVN for each of the major airlift aircraft--the C-130, the C-123, and the C-7.[31/]

Tactical airlift provided 40 to 50 percent of all resupply in III and IV CTZs, and many outlying areas in all CTZs were supplied completely by air.[32/] According to the Traffic Management Agency at MACV, 18 (13.5%) of the 133 airfields serviced by the 834AD in October 1969 were accessible only by air (Figure 20). "To gain access via other modes to these 18 remote airfields," the agency said, "would require major military and engineering efforts."[33/] Air Force sources challenged this contention--some bases, they pointed out, were, for example, located near navigable water routes--and also claimed that even more fields were actually serviced only by air than were listed.

Another problem was competition for airspace between rotary-wing and fixed-wing traffic. Austere fields such as Vinh Long, Cu Chi, and Di An averaged well over 30,000 traffic cycles per month. But of the 40,000 traffic cycles per month at Cu Chi, only 970 were by 834AD aircraft.

Of the 28,000 cycles at Can Tho, only 1,500 were from the 834AD, with fixed-wing aircraft forming only a small fraction of the total traffic. The U.S. Army operated more helicopters inside Vietnam than were contained in the combined helicopter inventories of the rest of the Free World. These large numbers, together with the mobility of organizations such as the 1st Cavalry Division (Air Mobile), resulted in a saturation of airspace never before encountered.[34/]

POL delivery at forward airfields in the Delta was an enormous and difficult task. Five hundred helicopters supported the Army in the Delta, and 834AD units hauled the fuel that kept these aircraft in operation. The C-7 could carry 12 drums of fuel; the C-130, 70 to 76. It took six C-7s to carry the same number of barrels as one C-130. The C-7 could not be configured with the fuel bladders which gave added load and convenience to the C-130 and the C-123. When the big planes could not get in, transshipment to smaller fixed- and rotary-wing planes became a serious, time-consuming problem. There were five bases in the Delta which had been or could be made C-130-capable; but, as of March 1970, C-130s could land at none of them. One was completely closed, two were C-123-capable, and two would accommodate the C-7 only. These figures demonstrate how little attention was paid to the airfield problem--a perplexing one for the 834AD.[35/]

A number of environmental hazards also affected operations at marginal airfields. Long periods of adverse weather, combined with a lack of instrument approach aids, created real hazards for aircrews. Heavy traffic

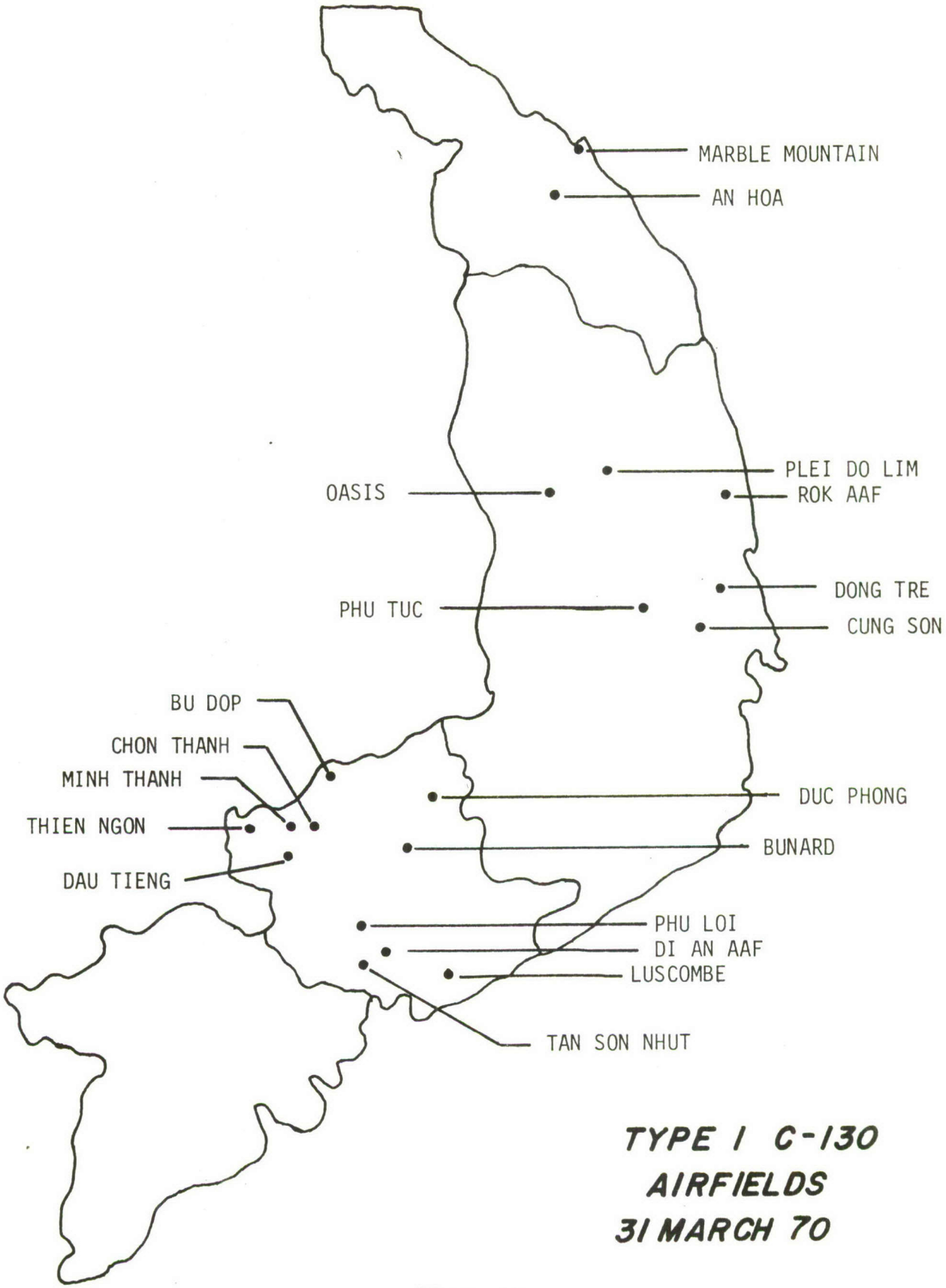
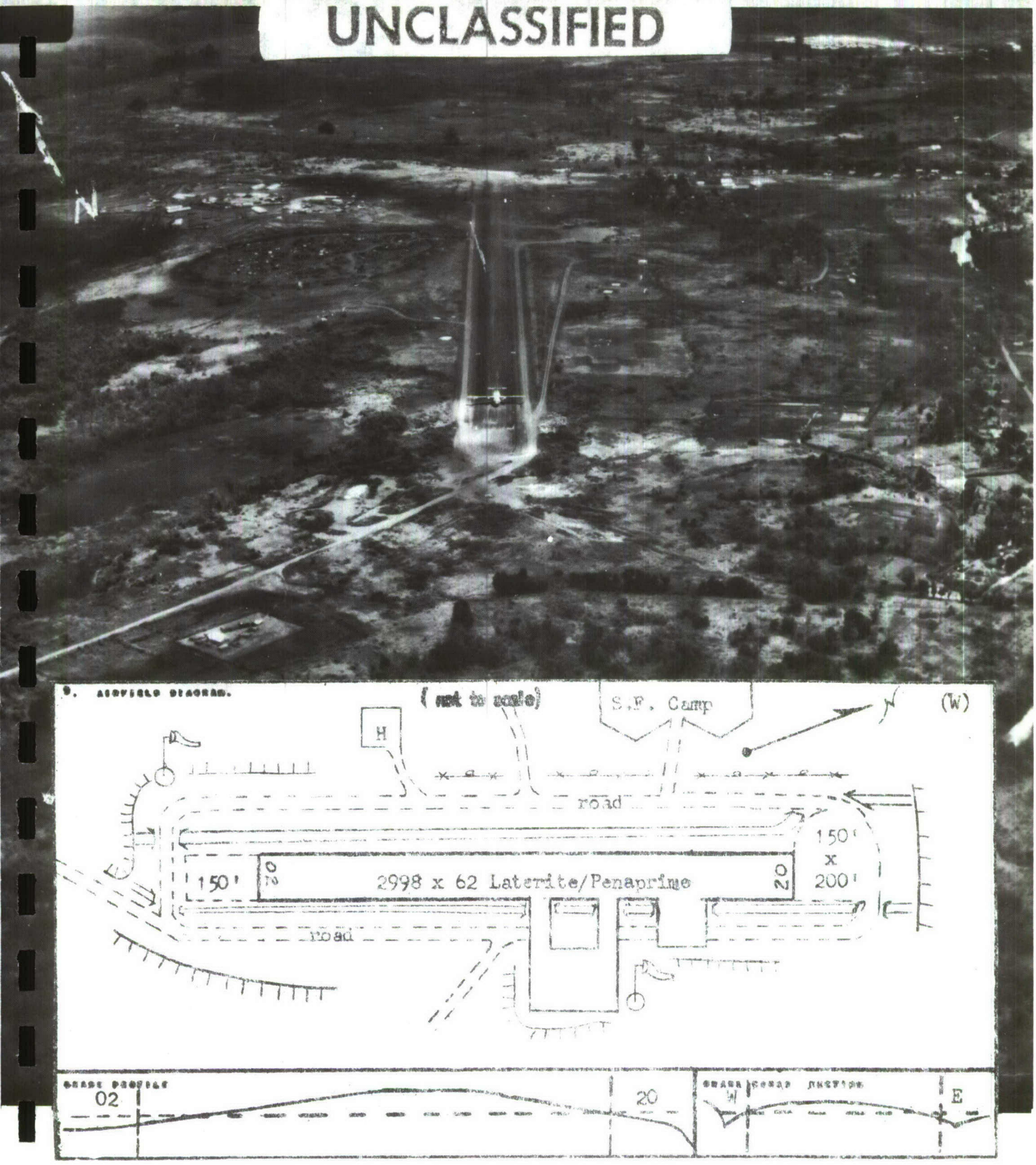

MARBLE MOUNTAIN
AN HOA
PLEI DO LIM
OASIS
ROK AAF
DONG TRE
PHU TUC
CUNG SON
BU DOP
CHON THANH
MINH THANH
DUC PHONG
THIEN NGON
BUNARD
DAU TIENG
PHU LOI
DI AN AAF
LUSCOMBE
TAN SON NHUT
TYPE I C-130
AIRFIELDS
31 MARCH 70

FIGURE 14



In December 1969, Duc Phong was a Type I C-130 forward airfield servicing an ARVN and U.S. Special Forces camp in III Corps. The runway was good when dry, but soft and slick when wet, restricting C-130 landings. Hazards included eight-foot drops 20 feet from the edges of the runway and two-foot ditches adjacent to both shoulders.

FIGURE 15

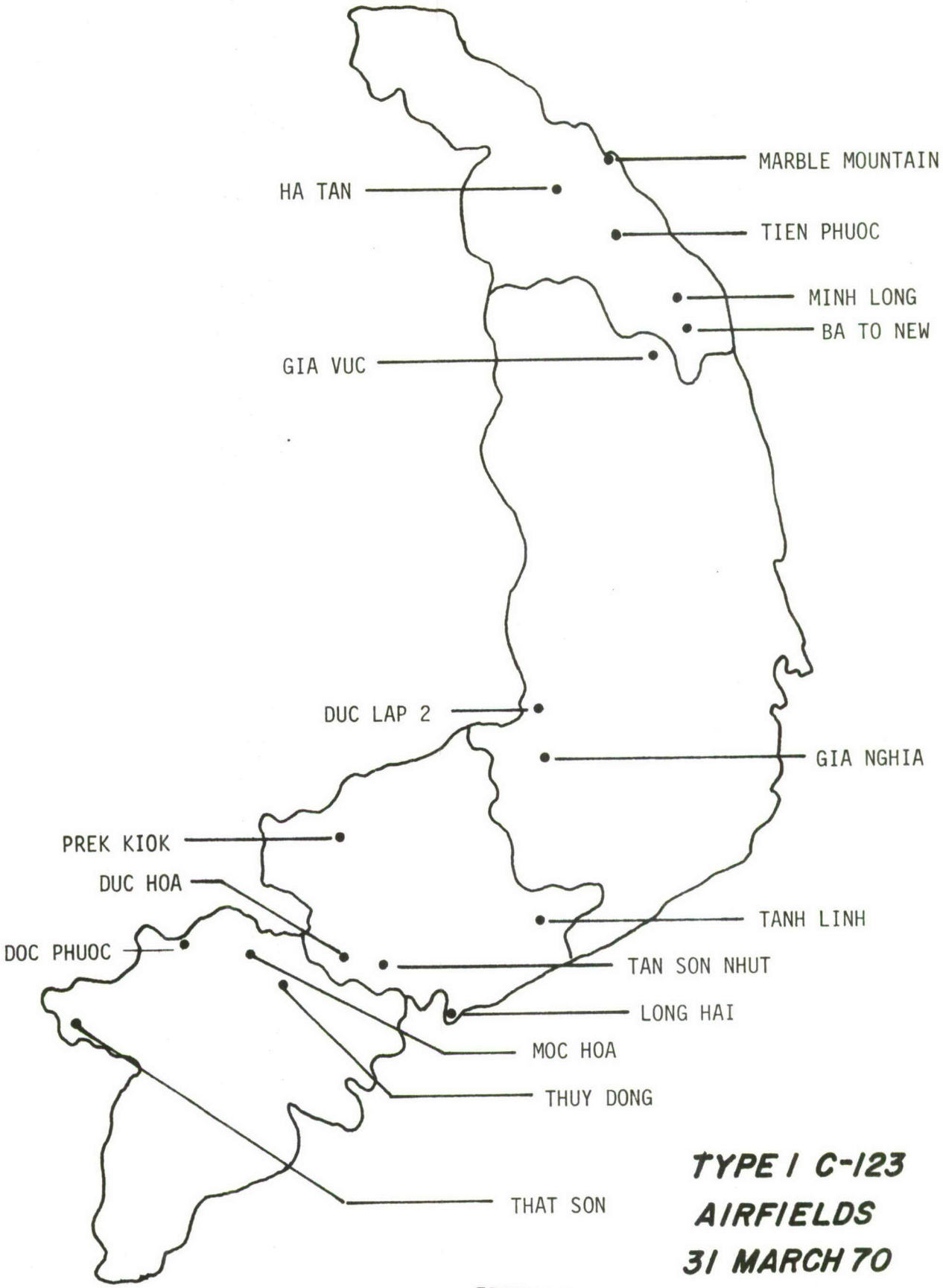
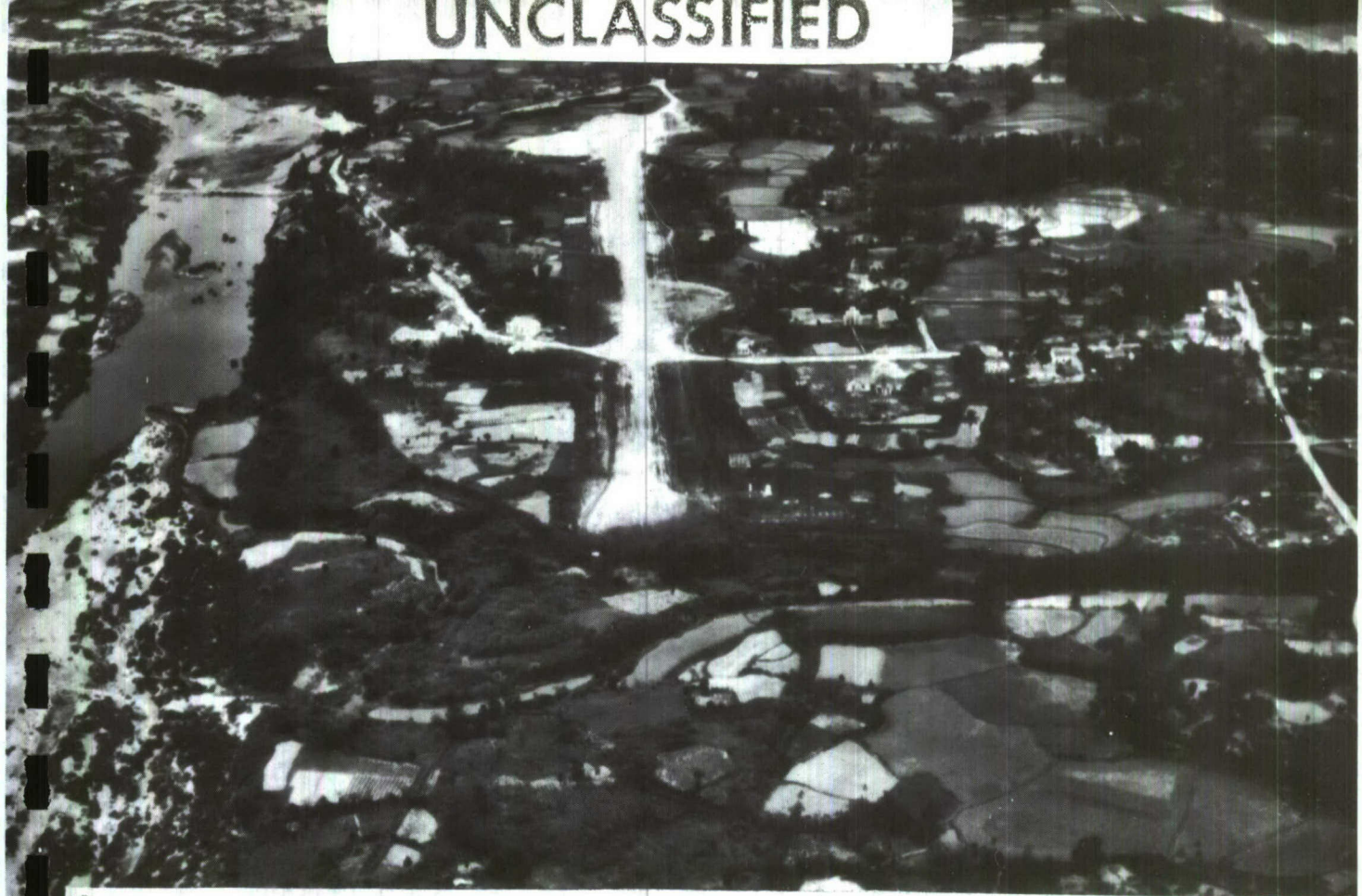
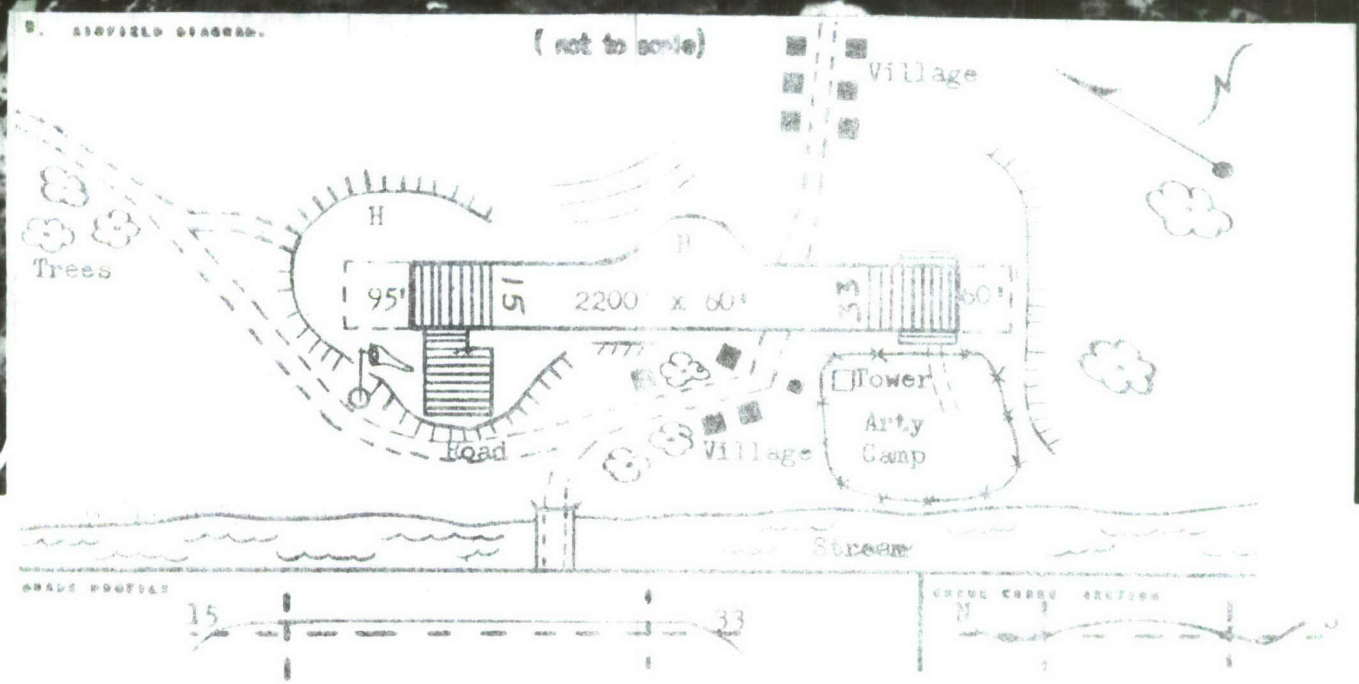

MARBLE MOUNTAIN
HA TAN
TIEN PHUOC
MINH LONG
BA TO NEW
GIA VUC
DUC LAP 2
GIA NGHIA
PREK KIOK
DUC HOA
TANH LINH
DOC PHUOC
TAN SON NHUT
LONG HAI
MOC HOA
THUY DONG
THAT SON
TYPE I C-123
AIRFIELDS
31 MARCH 70

FIGURE 16





Tien Phuoc was a Type I airfield for C-123 aircraft and Type II for C-7s. Located in a populous area of central I CTZ, Tien Phuoc was troubled continuously by trespassing cattle and pedestrians who found it a convenient thoroughfare, even during takeoff and landing operations. The runway, which also served as a helipad, softened and rutted when wet.

FIGURE 17

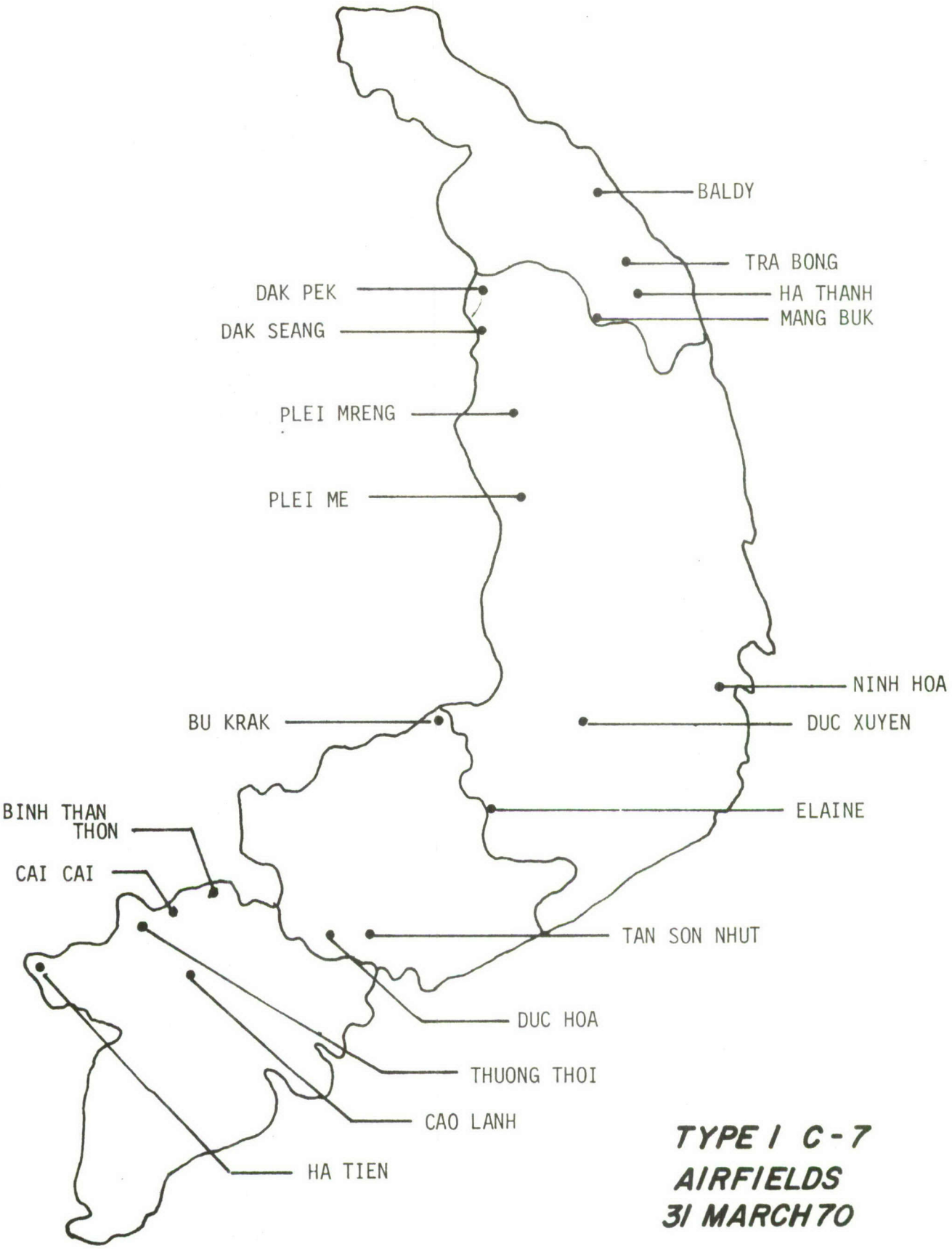
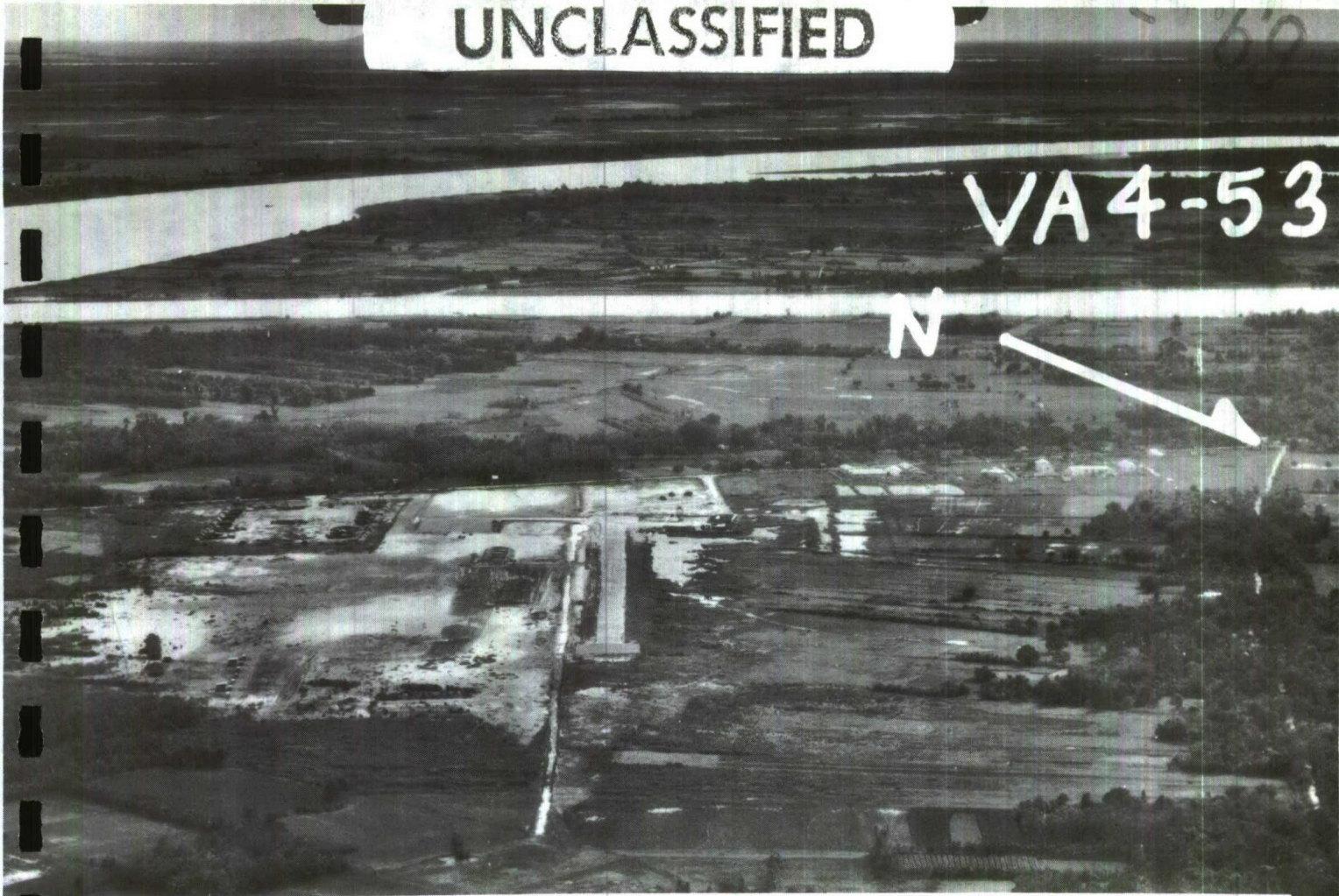
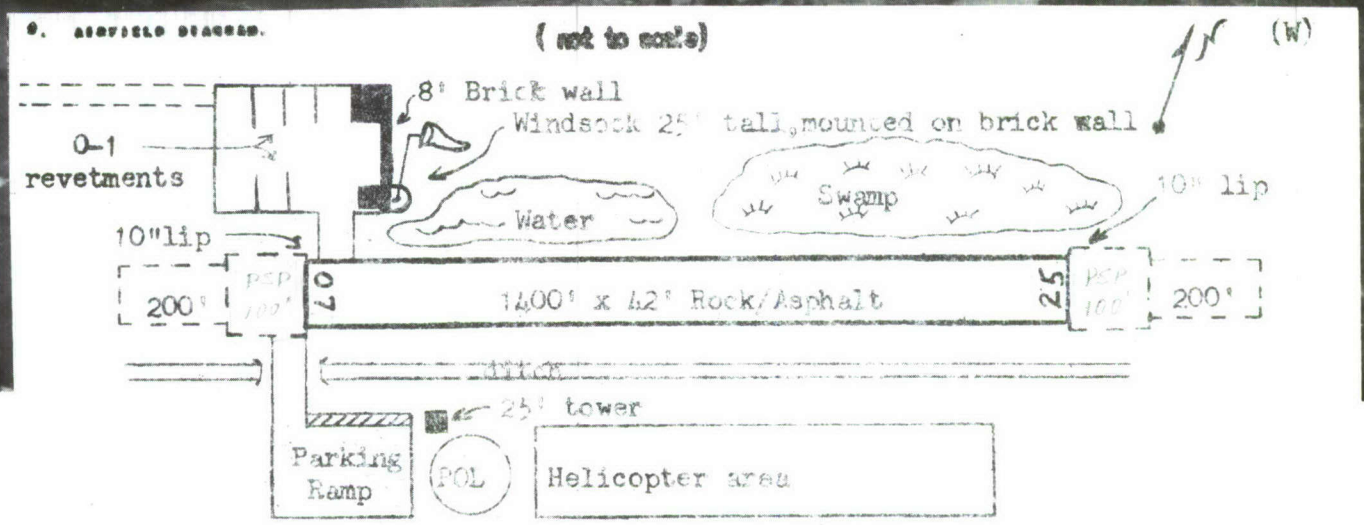

BALDY
TRA BONG
DAK PEK
HA THANH
MANG BUK
DAK SEANG
PLEI MRENG
PLEI ME
NINH HOA
BU KRAK
DUC XUYEN
BINH THAN THON
ELAINE
CAI CAI
TAN SON NHUT
DUC HOA
THUONG THOI
CAO LANH
HA TIEN
TYPE I C-7 AIRFIELDS 31 MARCH 70

FIGURE 18





This airfield at Cao Lanh in IV CTZ in the Mekong Delta is typical of the Type I C-7 airfields dispersed throughout RVN. In the Delta, runways were often the only high ground during the wet season. As a result, cargo offloads in this area often encroached on the runway itself. Even in 1970, this problem still defied solution.

FIGURE 19

Airfields in RVN serviced by the 834AD accessible only by air as of 3 October 1969.

V/NR	NAME	CLASSIFICATION (TYPE) C-130	C-123	C-7A
2-21	NHON CO	II	II	II
2-39	BAN DON	II	II	II
2-41	MANG BUK			II
2-42	DAK PEK			I
1-43	GIA VUC		I	II
1-66	GERBER			I
1-72	MAI LOC		I	I
2-92	PLATEAU GI	I	II	II
3-94	DUC HUE			II
2-97	DUC XUYEN			I
1-102	MINH LONG			II
1-112	TRA BONG			I
2-176	BU KRAK		I	
4-197	DON PHUOC		II	
1-239	TIEN PHUOC	I	II	
2-265	TIEU ATAR		II	
1-272	BA TO (NEW)	I	II	
2-283	DAK SEANG		I	

Figure 20

at all airfields and the barriers to flight posed by hostile artillery and high threat areas added to the hazardous flight conditions at forward locations. But the marginal airfields themselves comprised the greatest hazard to safe airlift operations in Vietnam. Although the majority of airlift operations originated at major airfields, the changing pattern of combat operations required constant use of semi-improved short runways. There were still 50 Type I "minimum operational"airfields in use at the end of 1969, even though airlift tonnage requirements were on the downturn. 36/

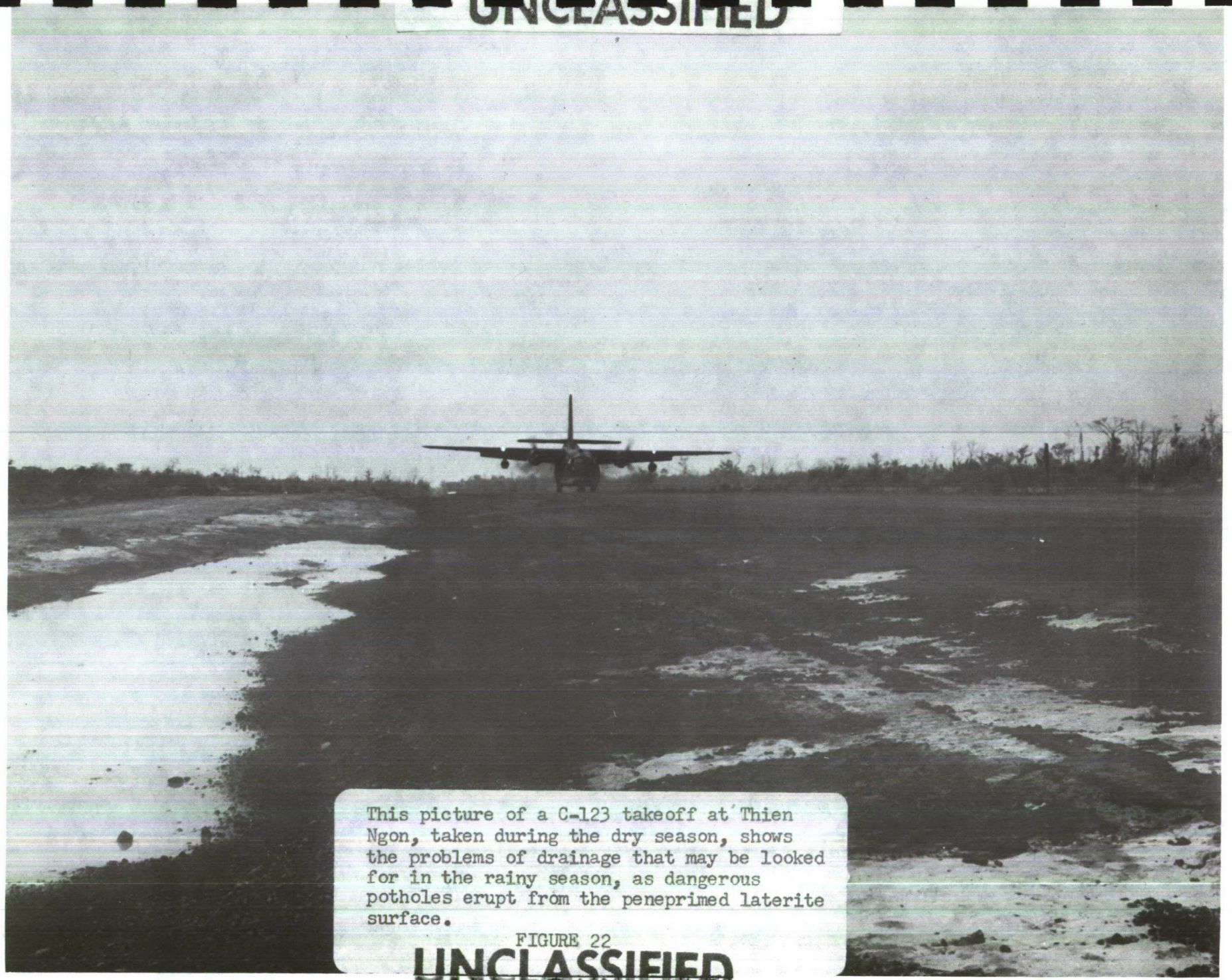
CHAPTER II

FORWARD AIRFIELDS

In mid-1970, airfield maintenance was a persistent problem, complicated by the sheer number of the fields involved, the different agencies influencing engineering efforts, the shifting of usage because of tactical necessity, and the initial design of the strips. Although every airfield in Vietnam had unique engineering problems, all deficiencies could be categorized under three, interrelated phases of activity: design and construction, occupation, and active operation.[37/]

Originally, the majority of airfields in RVN had natural surfaces of sod, clay, dirt/earth, and sand. In the winter dry season, the hard-packed laterite runways released clouds of blinding dust (Figure 21), and in the summer wet season they were often slick and hazardous. Laterite runways were usually studded with protruding sharp rocks and chuckholes which were harmful to tires, landing gear, and gear-door fairings. Consequently, tires had to be changed frequently. Maximum-performance landings and takeoffs on semi-improved airstrips hastened the deterioration of the surfaces (Figure 22). Peneprime, a low viscosity tar, was used for stabilizing the surfaces of runways, taxiways, and parking areas to counter dust and mud. Its advantages were relatively low cost and rapid application. Nevertheless, the lack of permanence in a peneprime surface prompted increased use of aluminum matting (AM-2 or MX19) on the runways, along with light-duty steel matting (M8A1) and pierced-steel planking. The metal-surfaced runways, however, tended to curl and break under loaded aircraft, and the edges of the matting cut tires.

An RAAF "Wallaby" lands on a laterite runway during the dry season. While the use of full reverse in landings often produced blinding dust, laterite runways were usable during both the wet and dry monsoon seasons.
FIGURE 21



This picture of a C-123 takeoff at Thien Ngon, taken during the dry season, shows the problems of drainage that may be looked for in the rainy season, as dangerous potholes erupt from the peneprimed laterite surface.

FIGURE 22

Most forward airfields were not designed for heavy aircraft; five C-130 landings on AM-2 aluminum matting produced the same wear as 60-C-123 landings.[38] Air-landed cargo often piled up at forward bases because of limited space and the inability of the Army to transship the goods as rapidly as they arrived. The congestion at times encroached on the runway, making continued fixed-wing airlift impossible.[39] In many cases an airfield was limited to one aircraft on the ground at any given time.[40]

A TYPICAL BASE

Thien Ngon in III Corps, four kilometers from the Cambodian border, was a typical forward airfield. Originally a fire support base for the 1st Cavalry Division, in April 1970 the field was a logistics center for War Zone C, providing water and supplies for a large surrounding area. The Airfield Coordinator was a nonrated, Corps of Engineers first lieutenant, who controlled ten special forces troops and 500 Civilian Irregular Defense Group troops.[41]

The 2,900-foot runway had a thin peneprime cap over well-compacted laterite with few pot holes. There was no separate helicopter landing area, and 10-ship combat assault formations landed on the main runway. In support of its helicopter operations, the base consumed 4,000 to 5,000 gallons of fuel daily. Fuel was stored in 30,000-gallon bladder bags. (Figure 23). The "control tower" was a crude bunker made from empty fuel drums reinforced with sandbags (Figure 24). Thien Ngon boasted a wind sock, unlike many forward airfields which lacked even this rudimentary landing aid. There

were no navigation aids. Mud limited the open storage areas, adding to the congestion (Figure 25).[42/]

As the aerial photograph shows, three laterite taxiways led to a parking area 210 by 750 feet (Figure 26). All shoulders and the 150-foot-square turnabout at the south end softened during the wet season. A local road ran directly into the center of the runway. There were shallow ditches on each side of the 90-foot-wide runway, restricting lateral clearance. The road parallel to the runway to the east was a part of Route QL 22, a heavily-travelled road; the one to the west was little used. There were 80-foot trees 600 feet from one end of the runway.[43/]

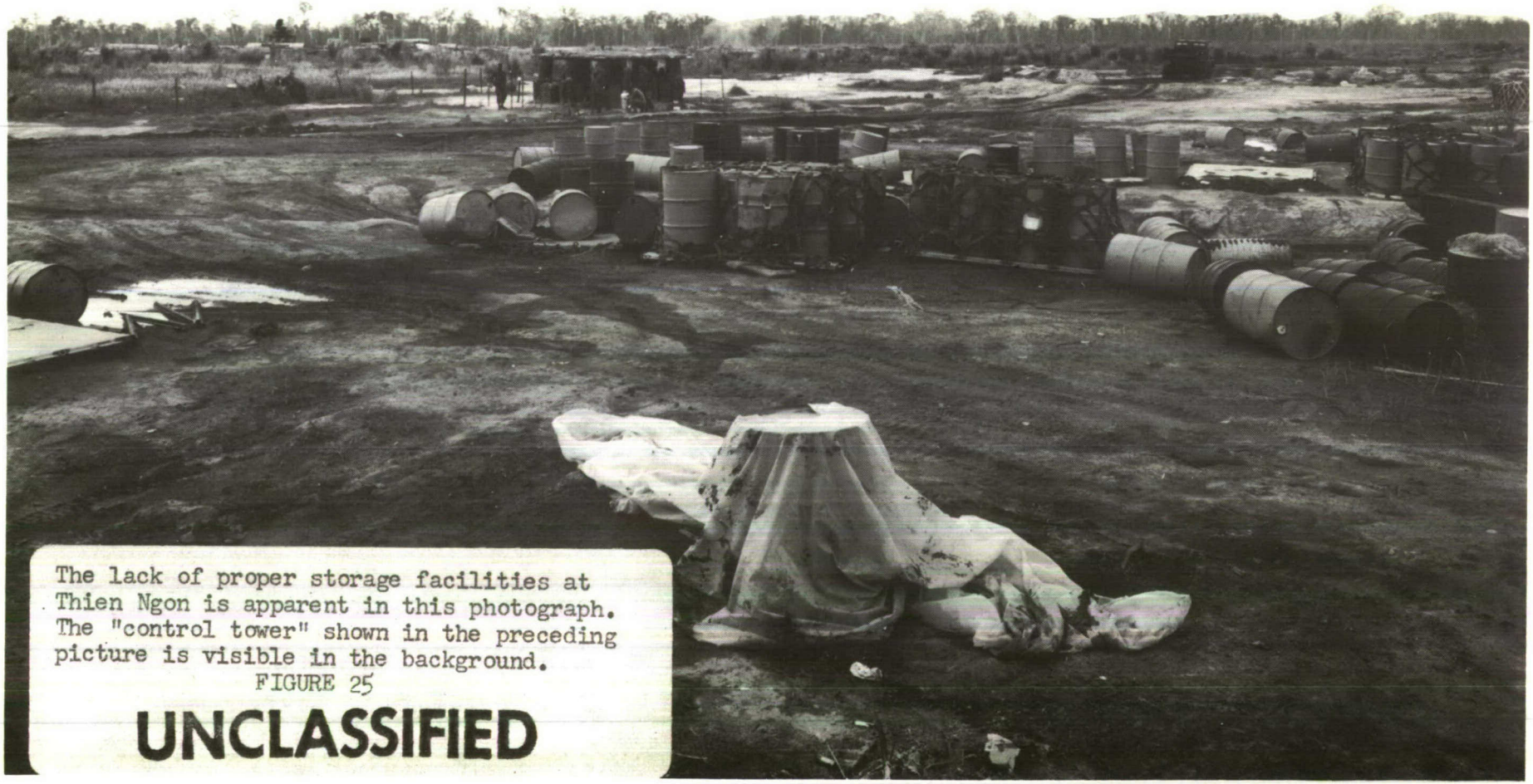
The field had originally been designated as Type II for the C-130, the C-123, and the C-7, but a deteriorated runway surface soon made it unsuitable for the C-130. The resident engineers considered the main problem with runway maintenance to be the breaking of the peneprime surface by aircraft touching down, continually shortening the usable length of the runway. Similarly, engines running at full power on aircraft ready for takeoff tended to blow away the surface. During the wet season a "pumping" action under the matting on the 100-foot overruns caused subsurface erosion.[44/] In April 1970, a project was underway to install M8A1 matting on the ends of the runway to reenforce the surface at the points of greatest wear. The Army engineers did all the construction work, using the Vietnamese to provide security. In the opinion of the II Field Force Vietnam (IIFFV) Tactical Air Liaison Officer (TALO) who observed the repairs being made, Air Force Combat Control Teams should always actively advocate Air Force interests in such repairs to minimize potential hazards to safe flight.[45/]

Giant bladders such as these supported helicopter operations at forward airfields. Vulnerability to rocket attack is obvious. Inset: A C-130 "bladder bird" offloads fuel at Thien Ngon.

FIGURE 23

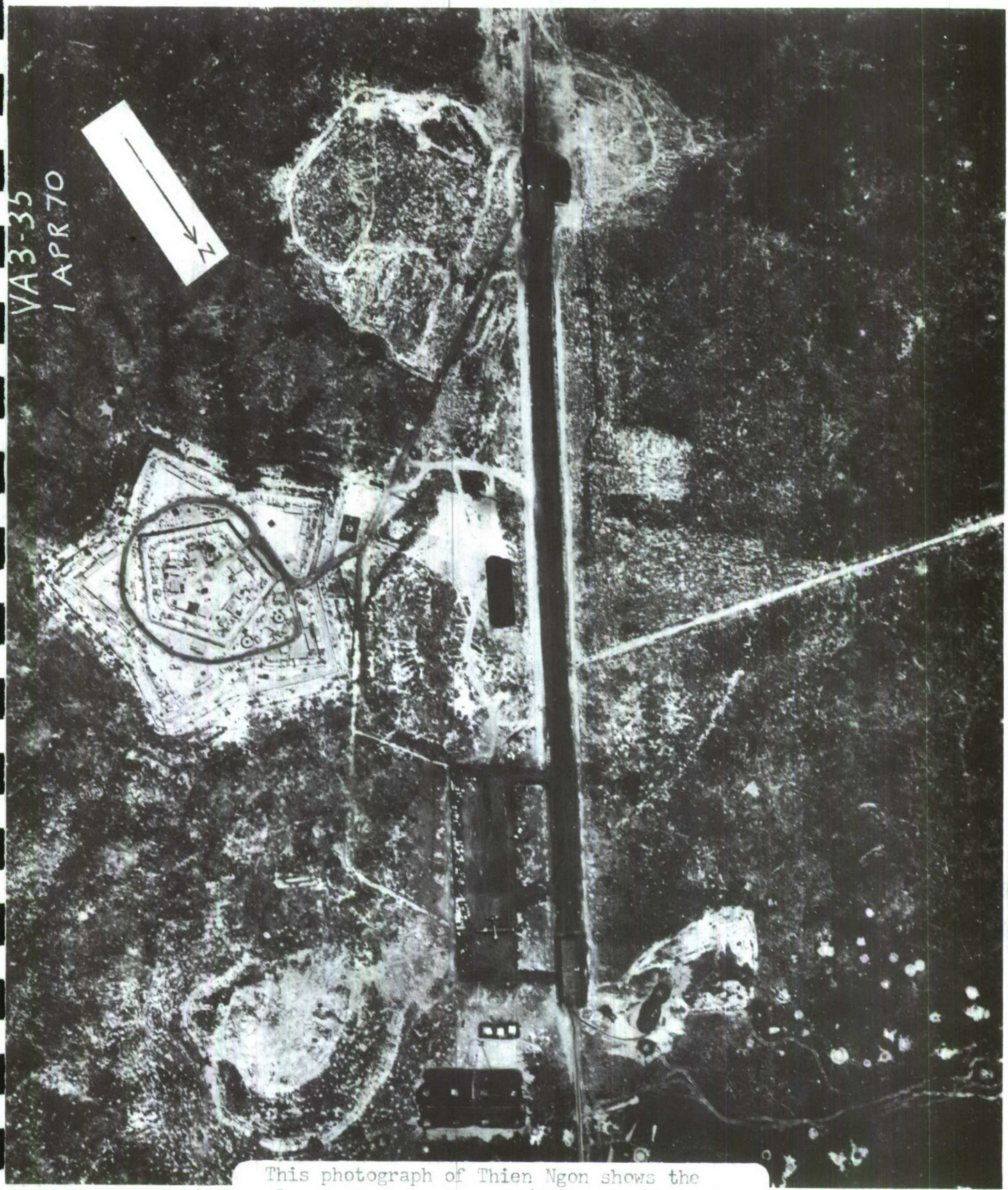
The "control tower" of the forward airfield at Thien Ngon. The POL drum-cum-sandbag structure was a typical shelter. This depressing picture was taken during the dry season.

FIGURE 24



The lack of proper storage facilities at Thien Ngon is apparent in this photograph. The "control tower" shown in the preceding picture is visible in the background.

FIGURE 25



This photograph of Thien Ngon shows the classic layout of an SF/CIDG camp/airfield complex, the airstrip located outside the main camp defense perimeter. The 30,000-gallon fuel bladders are visible at the north end.

FIGURE 26

FACTORS AFFECTING DESIGN

The contrasting terrain of South Vietnam, from the paddies of the Mekong Delta to the highlands of the central interior, presented engineering problems which compromised design criteria. Heavy seasonal rains and lack of gravel in the Delta region made extensive dredging necessary before even the most austere airfield could be built. Every shovelful of dirt removed created a miniature lake. During the wet season, refueling pads became islands, and there were continual problems of drainage between the taxiway and the runway. Runway subgrades were often poor, as at Cheo Reo and Loc Ninh. Mountains affected the design of airfields to an even greater degree, with over half of the II Corps airfields on ridge tops (Gia Nghia, Bu Krak) or in valleys (Tra Bong, Dalat Cam-Ly). Approach and lateral clearances were minimal because of air and ground traffic congestion at these bases.[46/]

The majority of airfields deviated from established design and construction criteria because of low engineering priorities, insufficient money or materials, lack of manpower, and the need for expediency. As a result, trees and other obstructions that encroached on the approach and lateral areas were left standing, the runway composition and compaction were deficient, and shoulders, overruns, or parking facilities were limited. In many cases it was difficult to remove trees blocking the runway because of GVN protective rules, such as those for rubber trees.[47/]

Another factor which influenced design was the changing tactical environment. At most bases there were 12 to 18 U.S. personnel, reinforced with CIDG and ARVN special operations troops. Most of the time, these bases were little "sleepy hollows," responsible for routine resupply action. But almost overnight, in response to an important battle or a special operation, bases such as Khe Sanh, Ben Het, or Bu Prang were transformed into major airfields.

The impact of a shifting tactical situation was evidenced at a 1st Cavalry base, Djamap, in III Corps, which had been abandoned since 1966. Although the runway had been 4,100 feet long when originally built, the April 1969 Tactical Aerodrome Directory warned that there were holes in the center of the runway, 18 camouflaged ditches, and holes two-thirds of the way down the runway--results of an Arc Light strike. Early in 1970, the site was needed again as a Mission Support Base with underground bunkers, and by late March the runway had been restored to 3,400-3,500 feet, enabling it to support C-130 landings.

At Tonle Cham, a small field near the Cambodian border, normal traffic consisted of one C-7 a week to supply a small special forces detachment. Enemy activity picked up in the fall of 1968, and the small forward airstrip became a major field. A brigade of the 1st Cavalry Division moved in, followed closely by a brigade of the 1st Infantry Division. In a short time, traffic was up to 200 cycles a day. With much activity in close proximity to the field, the trash dump began to encroach on the runway, and the resulting congestion was responsible for a C-130 accident. Many problems at forward airfields arose because a base suddenly had to support operations far larger than those for which it had originally been designed.[49/]

But the majority of airfield problems affecting airlift had their origin in minimum design criteria. Most Army airfields had originally been built to meet limited local tactical situations and not to support overall strategic or tactical plans. Most were built with a definite life span--usually six to 12 months. The Army built the minimum field necessary for fixed-wing

operations to accommodate their own light Otters and Beavers, making serious problems for C-123s, C-130s, and even C-7s under taxi and off-load conditions. In addition, most Army fields had been built without taking into consideration the logistics needs for immediate or long-range operations (Figure 27). The distribution channel for supplies to a field did not come from a master plan--rather the supply system evolved as the field was used.[50]

During the initial stages of U.S. involvement in Vietnam, there had been justification for the policy that the life span of airfields should be six months to one year and that minimum design criteria were sufficient. It is understandable that many of the airfields constructed then deteriorated to the extent that air/land operations became impractical, inefficient, and hazardous. But instead of benefiting from the experience of the preceding four or five years, U.S. ground forces in 1970 continued to underdesign airfields, in the interests of expediency and saving money and manpower. The only real gains were the initial savings in money and construction time. In almost all cases, proper initial engineering would have prevented costly major repairs and loss of airlift efficiency during repair periods. In addition, the possible loss of a million-dollar aircraft with its crew made the need for adequate engineering design and foresight obvious.[51]

ARMY/AIR FORCE JOINT OPERATIONS

There were also problems of joint operations. Most forward airfields were occupied by single Army units, often as small as a 12-man special forces "A" team. The senior Army officer was also designated Airfield Coordinator. His knowledge of airfield duties, the requirements of technical bulletins, and even rotary- or fixed-wing operations was often minimal. He frequently

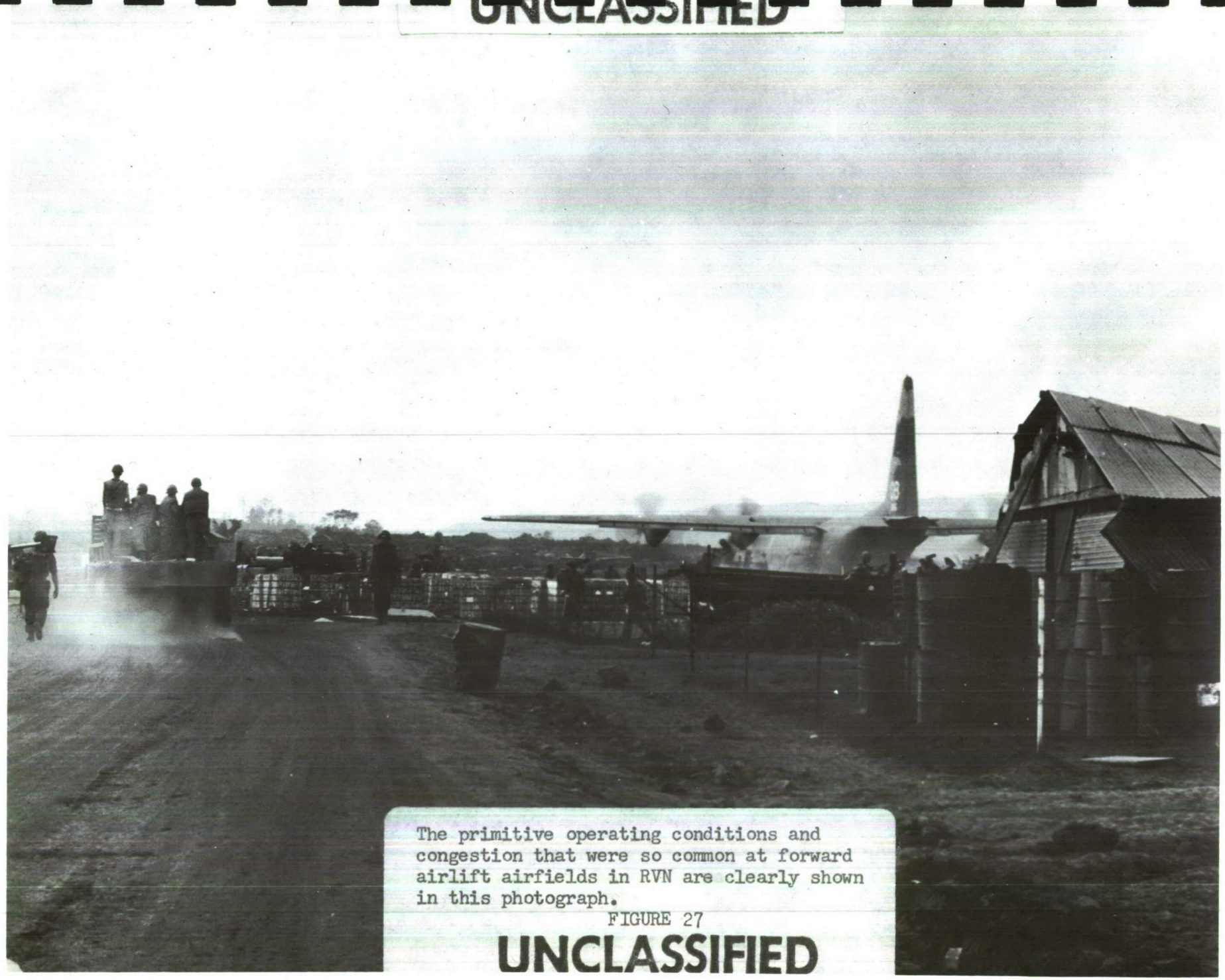
[redacted]

did not understand support of fixed-wing operations as defined by MACV Regulation 415-9, his chief concern being the defense of his immediate area and the conduct of necessary training and combat operations. Because of limited real estate and the need to refine the defensive posture, most camp facilities and activities gravitated to the airstrip. The camp's airfield was the central point of resupply and, consequently, the hub of all other activity. Bunkers, paths, and roads were usually built near the runway, often with minefields adjacent to both runway edges. As at Kien Long and Dinh Quan, it was often necessary to relocate artillery setup in the approach zones, prior to bringing fixed-wing traffic into the field. Air Force operations were generally hazardous at best.[52/]

There was also significant confusion over the duties of the airfield commander. In some instances, his duties were either not known to him or were given only lip service, for reasons of expediency. The U.S. Army airfield commander at Soc Trang, a good field with 3,200 feet of asphalt surface, assigned USAF the poorest facilities at the base, with barely enough operating space and a limited number of off-load points. On one occasion, a C-130 which had been forced to park in a helicopter revetment was hit by a helicopter. Air Force personnel operated continually at this relatively permanent base on a make-do basis.[53/]

Planning and control were especially necessary in all aspects of movement into airstrips. Laxity on the part of the airfield coordinator increased the likelihood of accidents. One example of an uncoordinated operation occurred at Dong Xoai, a 3,000-foot strip in III Corps. The field was operated by Vietnamese civilians with special forces advisors,

[redacted]



The primitive operating conditions and congestion that were so common at forward airlift airfields in RVN are clearly shown in this photograph.

FIGURE 27

but with no one really in charge. When the tactical situation required moving in large numbers of helicopters and airlift aircraft,uncontrolled traffic on the field became a constant source of delay. Cargo was piled right beside the runway and was transshipped to outlying areas by Chinook helicopters. Helicopter pilots used the runway for takeoff and landing. In one incident, the 132-foot wing of a landing C-130 overlapped both the boxes piled by the runway and a parked helicopter. The wing passed over the boxes but hit the blades of the chopper.[54/]

At Tra Vinh in IV Corps, the runway was 100 feet wide and helicopters were parked in the lateral clear area. Thus, any directional control problem could result in some aircraft loss and a delay of tactical operations. In such situations, USAF planes could not afford to land. Helicopters parked in the lateral clear area were required to park with fuselages parallel to the runway; but during refueling or rearming, safety dictated parking the choppers so that the accidental firing of a rocket would not damage nearby aircraft. In most cases, problems such as these could be resolved only by close coordination between aircraft operators (Figure 28).[55/]

If operations required mixing helicopter and fixed-wing traffic, control was definitely marginal. The radio advisor, more often than not, was deep in a bunker and unable to see the runway. Frequently, he was not a qualified air traffic controller; but a parachute-qualified pathfinder, whose primary mission was to insure smooth operations in the helicopter pick-up zone. He could advise on airfield conditions, and he was able to clear obstructions from the runway, but pilots still landed at their own discretion.

[redacted]

AIRFIELD MAINTENANCE

Another factor limiting fixed-wing airlift operations at various forward airfields in 1970 was inadequate airfield maintenance. Unfortunately, the Air Force did not have the personnel or the equipment to keep critical forward airfields ready and usable for fixed-wing operations; besides, Air Force attention was always concentrated on the big airports--Cam Ranh Bay, DaNang, Tan Son Nhut--with jet-capable runways. Except for aerial port and combat control teams, the Air Force was completely dependent on the Army for the suitability of fixed-wing facilities and services at forward locations.[56/] Because of the substandard runway surfaces at the majority of forward airfields, deterioration was a continuing problem, often serious enough to suspend an airlift operation temporarily or to close an airfield permanently.

Adverse weather presented major obstacles to all aspects of U.S. operations in Vietnam, and the effect it had on marginal airfields was great. Heavy seasonal rains left many fields unusable for long periods, especially in the Delta region, where some runways with poor drainage remained under water and were unusable for the entire wet season. Runway matting was not enough to preserve marginal fields, because extensive erosion of the sub-surface made major sub-grade repair and replacement of matting an annual undertaking.[57/] Truc Giang, for instance, had 3,000 feet of AM-2 matting and had been a Type III C-130-capable field in 1966. By early 1970, the runway length was down to 2,800 feet and the foundation had been so extensively eroded beneath the matting that the runway could no longer support the weight of a C-130, or a C-123. In fact, even a C-7

[redacted]

A C-123 taking off at a small airfield in the Mekong Delta. JP-4 drums litter the foreground, which is also crowded by pallets of cargo. Often without air-to-ground communications, airlift pilots set up their landing approaches with the guidance of a wind sock. At other fields, even this rudimentary aid was often lacking. FIGURE 28

[redacted]

could land only with difficulty. Moc Hoa had had 2,900 feet of antiskid-treated M9A1 matting in 1966 and had been a Type III C-130 field. By early 1970, with the runway breaking up badly, the field was downgraded to a Type II C-7 field. The crushed rock and stone surface on the 4,000-foot runway at Kien Giang had been adequate for a Type II field for C-123 and C-7 operations in 1966. By early 1970, it was so rough that the field was closed to all 834AD aircraft.[58/]

The number of operational airfields for airlift aircraft dwindled from a high of 172 in January 1968 to 139 in early 1969, to a March 1970 level of 138. Half of this loss was directly attributable to the deterioration of landing surfaces. This figure does not include those airfields downgraded--from Type II to Type I, or C-130 to C-123--with attendant loss in airlift capability.[59/] There was an obvious need for some agreement with the Army for an Air Force voice in the vital decisions concerning the construction, operation, and maintenance of these fields.

Almost without exception, forward airfields had no immediate, responsive on-site maintenance capability. Because of the limited supply of engineering manpower in-country and the low priority assigned to airfields, preventive maintenance was nonexistent. Most of the available engineering capability was directed to airfields on an emergency basis only after runway deterioration had exceeded the limitations for continued safe operations and operations had been temporarily suspended. This regressive management practice resulted in a decrease in airlift responsiveness, complete loss of or less efficient airlift, and a smaller margin of safety for aircrews.

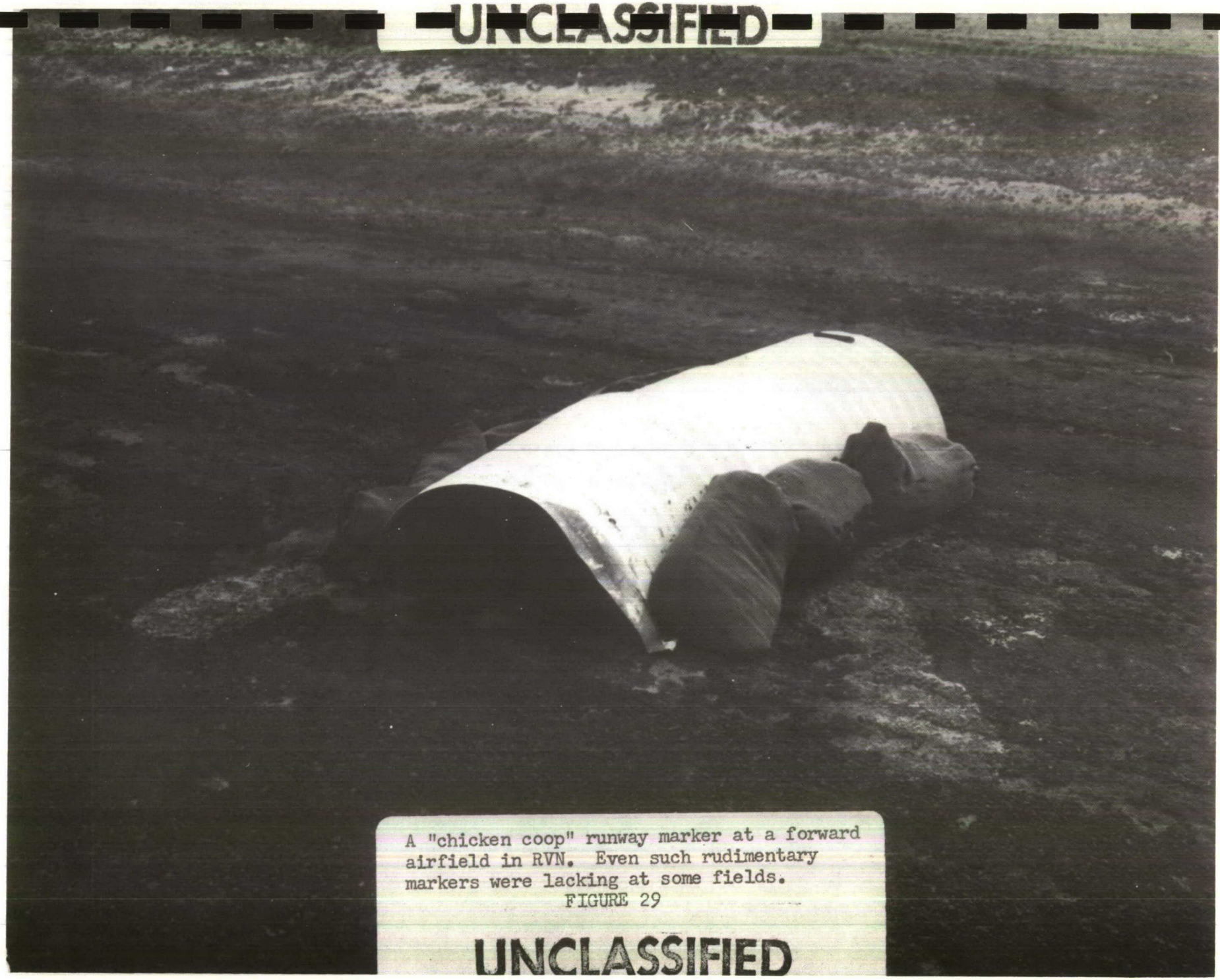
[redacted]

[redacted]

Moreover, there was a great variation in the way airfields were kept up. The 1st Cavalry Division (Air Mobile) had a good program for maintaining airfields in its area of operations; if others had done as well, there would have been no complaints from the airlift people. But a large percentage of the airfields on which the 834AD operated were at best "less than desirable." A civilian contract firm, Pacific Architects and Engineers (PA&E),had the contract for maintaining Army airfields, sometimes jointly with troops from the 165th Aviation Group. Under this arrangement, PA&E kept very small contingents at selected forward airfields to take care of the control towers, runway lights, base operations, NOTAMs, and maps and charts. But other Army fields lacked even such essentials as fire bottles, crash equipment, or runway markers.[62/]

Even with proper airfield maintenance, there were reasons why all airfields were not properly marked. At Ghia Ray, for instance, a small MACV field in III Corps, there were several reports of stolen runway markers. It turned out that the markers made very satisfactory chicken coops and hog sheds, but Vietnamese pigs and chickens were too nervous to be billeted so close to the runway; so the markers ended up in an unprogrammed civic action program (Figure 29). At Cu Lao Re, a small island off the coast of I Corps, the 834AD tried for months to put down markers, but they always ended up missing. The solution was to use white oyster shells, on the theory that, since there were so many, they would not be stolen. Also, helicopters tore up portable markers--the winds under a Huey often reaching 100 knots and under a Chinook, as high as 150 knots.[63/]

[redacted]



A "chicken coop" runway marker at a forward airfield in RVN. Even such rudimentary markers were lacking at some fields.

FIGURE 29

SUMMARY

Construction and repair of airfields under the handicap of limited engineering resources, capabilities, and priorities continued to be a persistent problem into mid-1970.

The difficulties at forward airfields suggested that certain elements of joint doctrine needed reexamining. Airfields were as much integral parts of the ALOCs as aircraft. When airfields were not properly engineered to begin with, the airlift operator was thereby deprived of the wherewithal to do his job properly. Airfields were also integral parts of the ground lines of communication. When an underdesigned field was torn up by the first few landings of heavy planes, the deterioration affected not only airlift services, but Army tactical operations as well. Even so, airfields never received the same priority as roads and highways. As a result, it was necessary for the Air Force to operate from most forward airfields with reduced safety features and at the price of excessive wear and tear on aircraft.[64/]

The function of forward airfields was to provide low-cost airstrips near operating Army units, where needed supplies could be delivered expeditiously. In order for the concept of forward airfields to prove viable, however, it was necessary to have close USAF/USA cooperation. As indicated in this report, such was not always the case. Low civil engineering priorities and misunderstanding of Air Force needs on the part of the Army led to runway deterioration and downgrading of forward airfields.[65/]

[redacted]

Airlift people did not believe that management of forward airfields had to be an Air Force responsibility; however, they did feel that consideration for USAF requirements needed to be built into the system. The austere design of most forward airfields led to the increasing use of C-7 aircraft, whose characteristics were better suited to operations on rough, short runways. For its part, USAF investigated the possibility of follow-on STOL aircraft which could carry a greater payload than the C-7, yet would not add to runway deterioration.[66/]

The concept of forward airfields added greatly to the tactical mobility of U.S. forces in Vietnam. The willingness shown by all the military services to discuss mutual problems through the JAOG was an indication that the need for cooperation was recognized. Responsibilities were clearly formulated. USAF had the capability to deliver supplies wherever they were needed, if the Army could provide usable forward airfields for the cargo planes.

[redacted]

FOOTNOTES

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2. (S) Special CHECO Report, "Assault Airlift Operations," 23 Feb 67; Special CHECO Report, "Tactical Airlift Operations," 30 June 69.

3. (U) Airfield Listing, Mar 70.

4. (S) Report, "Tactical Airlift Performance and Accomplishments--Southeast Asia," 834AD (DO), Mar 70. (Cited passage classified C).

5. (U) Report, "U.S. Air Force in Southeast Asia, "USAF Background Information 70-5, Apr 70, p. 16.

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6. (U) MACV Directive 415-9, MACDC, 8 Mar 70, pp. 1-3.

7. (U) Airfield Listing, Mar 70.

8. (C) Interview with Brig Gen John H. Herring, Jr., Commander, 834AD, by Lt Col R. F. Kott, 27 Mar 70. (Hereinafter cited: Herring Interview)

9. (C) Interview with Lt Col Eugene E. McClurg, Chief, Airfield Survey, 834AD, by Lt Col R. F. Kott, 29 Apr 70. (Hereinafter cited: McClurg Interview)

10. (C) Herring Interview.

11. (C) Ibid.

12. (U) MACV Directive 95-5, "Aviation, Airfield Operation in RVN," 20 Jan 70, p. 2.

13. (U) Ibid.; MACV Directive 420-1, "Repairs and Utilities, Airfield Maintenance in RVN," 28 Jan 70, p. 1.

14. (U) Ibid.

15. (C/AFEO) End of Tour Report, Maj Gen Burl W. McLaughlin, Commander 834AD, Nov 67 to Jun 69, p. 7-1. (Hereinafter cited: McLaughlin Report).

16. Ibid.

17. (U) End of Tour Report, Brig Gen William G. Moore, Jr., Commander, 834AD, Oct 66 to Nov 67, pp. 30-32.

18. (C) Interview with Lt Col G. O. Rogers, Chief TALO, 834AD, by Maj L. J. Johnson, 6 Sep 70.

(C/AFEO) End of Tour Report, Maj Gen Burl W. McLaughlin, Commander, 834AD, Nov 67 to Jun 69.

19. (U) MACV Directive 95-15, "Aviation, Joint Air Operations Group," 1 May 69, Annex A, p. 1.

20. Ibid.

21. (U) Joint Air Operations Group Briefing, 834AD JOAG representative's file, Sep 69.
(Hereinafter cited: JAOG Briefing).

22. (C/AFEO) McLaughlin Report, p. 7-4.

23. (U) JAOG Briefing, pp. 7-10.

24. Ibid.

25. Ibid., pp. 11-14.

26. (C) End of Tour Report, Col Joel C. Stephenson, DO, 834AD, Jan 68 to Jan 69, p. 4.

27. (U) JAOG Briefing, pp. 6-7.

28. Ibid., p. 33.

29. (C/AFEO) McLaughlin Report, p. 7-11.

30. (S) Report, "VNAF Status Review," Air Force Advisory Group, Jan 70, p. c-6.
(extracted data classified C).

31. Information supplied by DO, 834AD.

32. (C) Herring Interview.

33. (U) Letter, Traffic Management Agency, MACV, "Airfields Served by 834th Air Division, Air Accessible Only," 3 Oct 69.

34. (U) JAOG Briefing, pp. 34-35.

35. (C) Herring Interview.

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38. (S) Special CHECO Report, "Problems of Assault Airlift," unpublished manuscript, 7AF (DOAC), 9 Sep 66, p. 10. (Extracted materials classified C).

39. Ibid.

40. (C) Herring Interview.

41. (U) Interview with 1st Lt Paul F. Reichert, Corps of Engineers, 362nd Engineering Company (Light Equipment), by Lt Col R. F. Kott, 27 Apr 70.

42. (U) Interview with SFC Marvin J. Spitznagel, 362nd Engineering Company (Light Equipment), by Lt Col R. F. Kott, 27 Apr 70. (Hereinafter cited: Spitznagel Interview).

43. (U) Airfield Survey Report, "Thien Ngon," 834AD (DOCA), Apr 70.

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46. (C/AFEO) McLaughlin Report, p. 7-16.

47. Ibid.

48. (C) Herring Interview.

49. (U) JAOG Briefing, pp. 36-38.

50. (C) Herring Interview.

51. (C/AFEO) McLaughlin Report, p. 7-18.

52. Ibid., p. 7-17.

53. (C) Herring Interview.

54. (U) JAOG Briefing, pp. 14-15.

55. Ibid., pp. 21-22.

56. (C) Herring Interview.

57. (C/AFEO) McLaughlin Report, p. 7-19.

58. (U) Tactical Aerodrome Directory, South Vietnam, 15 Apr 69 and 15 Apr70; Herring Interview.

59. (C/AFEO) McLaughlin Report, p. 7-17.

60. (C) Herring Interview.

61. (C/AFEO) McLaughlin Report, p. 7-19.

62. (C) Herring Interview.

63. (U) JAOG Briefing, pp. 38-40.

64. (C) Herring Interview.

65. Ibid.

66. Ibid.

APPENDIX I

LISTING OF AIRFIELD EXCEPTIONS

TO CRITERIA

-1 JUN 69-

LEGEND

Clear Z:	Clear Zone
Clear A:	Clear Area
AZ:	Approach Zone
LSZ:	Lateral Safety Zone
IP:	Inadequate Parking
RTC:	Ramp Too Close
OR:	Overrun
S:	Shoulders
LG:	Longitudinal Gradient
RS:	Runway Surface
NR:	Narrow Runway
RWY LEN & WID:	Runway Length & Width

AFLD	ACFT	TYPE	Clear Z	Clear A	AZ	LSZ	IP	RTC	OR	S	LG	RS	NR	RWY LEN&WID
8	C130	II	X		X		X	X						4465x60 4465x100
9	C130	II	X	X		X								4860x125
10	C123	II	X				X							3238x95
11	C130	II	X	X		X		X						3650x60
12	C130	II	X	X										2740x95
14	C130	II	X			X	X	X						3110x60
15	C130	II	X				X	X			X			3610x95
16	C130	II	X	X	X	X	X	X						3100x125
17	C123	II	X	X		X	X							3700x95
18	C130	II					X	X						3500x60
20	C123	I	X				X	X						3485x60
21	C130	II	X	X			X	X			X	X		3700x110
22	C130	II				X	X	X						3460x60
23	C130	II	X			X		X						4900x90
26	C7	I												1890x93
27	C130	II												3600x100

AFLD	ACFT	TYPE	Clear Z	Clear A	AZ	LSZ	IP	RTC	OR	S	LG	RS	NR	RWY LEN&WID
30	C130	II	X	X							X			4000x100
31	C130	II	X			X	X	X			X			3450x60
32	C130	II	X				X		X	X				3700x100
33	C123	II	X		X		X							3355x100
34	C130	II	X											4250x98
35	C130	II		X			X	X						2310x60
38	C123	I		X		X								2000x75
39	C130	II					X	X				X		3700x60
40	C130	II		X		X	X							3920x96
41	C7	I	X	X		X		X						2000x50
42	C7	II	X	X	X	X		X						1500x60
43	C123	I	X	X	X	X	X	X						3261x100
46	C130	I	X	X		X		X						2640x58
50	C130	II	X											3770x84
51	C130	II		X		X	X							2900x60
52	C123	II	X		X	X	X							3680x100

UNCLASSIFIED

AFLD	ACFT	TYPE	Clear Z	Clear A	AZ	LSZ	IP	RTC	OR	S	LG	RS	NR	RWY LEN&WID
53	C7	I		X	X	X							X	1400x42
54	C123	I	X	X		X	X	X	X					2875x83
58	C7	II	X	X		X	X	X	X					2105x60
61	C123	I			X						X			2500x60
63	C123	II			X	X		X						2300x60
68	C7	I	X		X									2111x55
70	C123	I	X		X	X	X	X						2370x43
72	C123	I		X										2830x60
85	C7	I	X	X	X				X					1600x90
91	C130	II	X		X		X							3670x59
92	C130	I	X			X	X	X						2625x95
97	C7	I	X			X	X							2000x90
102	C7	I	X		X	X	X				X			1995x60
104	C130	II	X	X			X	X			X			3150x60
103	C7	I	X			X		X						3150x60
106	C7	I			X									1300x60
	C7													2300x80

UNCLASSIFIED

AFLD	ACFT	TYPE	Clear Z	Clear A	AZ	LSZ	IP	RTC	OR	S	LG	RS	NR	RWY LEN&WID
112	C7	I	X	X				X		X				1020X60
121	C123	II	X	X	X		X	X		X	X			2410X60
126	C123	II	X	X	X	X	X	X						3645X65
129	C130	I	X	X	X	X	X				X			2710X115
131	C7	II	X	X	X	X	X	X						1800X86
132	C130	II		X	X	X	X					X		3725X80
133	C7	II	X	X	X	X		X						1500x60
135	C130	II	X		X		X	X						3500x60
139	C130	II			X		X	X				X		4400x70
143	C130	II					X	X						3000x60
147	C130	II	X		X	X		X				X		3940x60
148	C123	I			X	X	X					X		2170x60
149	C130	I		X		X		X				X		3055x70
151	C7	I	X	X	X			X	X					1966x100
153	C130	I		X		X	X							2710x88
159	C130	II	X		X	X	X	X				X		3800x160
165	C130	II	X	X			X		X					3277x90

UNCLASSIFIED

AFLD	ACFT	TYPE	Clear Z	Clear A	AZ	LSZ	IP	RTC	OR	S	LG	RS	NR	RWY LEN&WID
166	C7	II	X	X			X							1600x75
167	C123	II					X	X		X		X		4035x98
169	C123	II	X	X		X	X		X					3444x95
173	C123	I	X	X			X	X					X	2000x60
176	C7	I	X	X		X		X						1800x70
179	C7	II	X						X					1500x60
	C123	II	X		X									2325x60
186	C7	I	X						X	X				2675x64
191	C7	I	X	X										1500x40
193	C7	II	X	X		X	X							1640x98
195	C130	I				X							NT	4500x60
197	C7	II	X	X		X	X							2087x120
199	C130	I	X	X			X							2500x60
200	C123	I	X	X					X			X		2000x80
201	C130	II	X		X	X		X						3690x60
202	C123	I	X	X		X	X	X						2000x80
204	C7	I	X	X	X	X								1300x60

AFLD	ACFT	TYPE	Clear Z	Clear A	AZ	LSZ	IP	RTC	OR	S	LG	RS	NR	RWY LEN&WID
205	C123	I	X	X		X	X		X	X				2055x80
206	C7	II	X	X	X	X	X	X	X					1893x60
	C123	II	X	X	X	X								2900x60
208	C7	I												1700x53
209	C7	I	X					X						1800x60
214	C123	I	X	X		X		X	X					2335x80
215	C123	I				X		X						3588x62
218	C7	I	X	X				X	X		X			1190x50
219	C7	II		X				X					NT	2797x64
221	C130	I	X	X			X	X			X			2869x85
225	C123	II				X								3532x60
226	C130	II	X	X	X	X								3500x90
227	C7	I	X	X	X	X	X	X						2200x70
232	C130	II				X	X	X						3605x60
236	C7	II		X	X	X			X					1708x60
239	C123	I	X	X	X	X	X	X						2035x60
240	C123	II	X	X	X									2330x60

AFLD	ACFT	TYPE	Clear Z	Clear A	AZ	LSZ	IP	RTC	OR	S	LG	RS	NR	RWY LEN&WID
241	C130	II	X			X	X				X			3300x60
247	C7	II	X		X	X	X	X		X				1500x51
248	C123	I	X	X		X	X	X						2006x60
252	C130	II	X	X			X							3500x60
256	C130	II	X			X	X	X						3935x100
257	C130	I	X			X	X							3310x72
259	C123	I	X			X		X			X			1949x60
260	C123	II	X	X				X			X			3485x59
	C130	II	X	X	X		X	X						3597x60
265	C7	II	X		X		X				X			1500x60
272	C123	I	X	X	X	X		X						2275x50
273	C7	I	X	X	X									1300x60
274	C123	I	X	X				X						2100x60
278	C123	I	X			X	X	X						2800x90
279	C123	I	X	X		X		X					X	2609x48
280	C7	I		X				X			X			3120x60
283	C7	I	X	X		X					X			1400x50

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AFLD	ACFT	TYPE	Clear Z	Clear Z	AZ	LSZ	IP	RTC	OR	S	LG	RS	NR	RWY LEN&WID
284	C130	I	X		X	X								2860x80
285	C130	II	X				X	X						3500x61
286	C130	II		X	X	X	X	X		X				3500x75
	C130	II	X	X	X		X	X				X		3000x60
289	C7	I	X	X	X			X						1450x75
291	C130	II	X	X		X	X	X						3445x60
292	C130	II	X	X	X	X	X	X	X			X	NT	3105x60
293	C7	II				X							NT	3500x60
294	C7	I	X	X	X									1200x50
295	C7	I	X	X				X						1640x56
297	C130	I	X	X			X	X			X			3050x60
300	C7	I	X	X		X		X			X			1404x60

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APPENDIX II

*MACV Dir 415-9

HEADQUARTERS
UNITED STATES MILITARY ASSISTANCE COMMAND, VIETNAM
APO San Francisco 96222

DIRECTIVE
NUMBER 415-9

8 March 1970
(MACDC)

CONSTRUCTION

C-7, C-123, AND C-130 AIRFIELD STANDARDS AND CRITERIA

1. PURPOSE. This directive provides airfield design, construction, and configuration standards, and establishes minimum airfield criteria applicable to the Republic of Vietnam (RVN) airfields utilized in support of C-7, C-123, and C-130 aircraft operations, and provides minimum airfield criteria for OV-10 aircraft (see Annex A).

2. APPLICABILITY. This directive is applicable to all MACV field elements and subordinate commands.

3. GENERAL.

a. The airfield standards and criteria established in this directive are designed to provide satisfactory facilities with the required flexibility and support, with a minimum of fund expenditure and engineering effort. All organizations responsible for airfield design, construction, maintenance, and operation are to implement the necessary programs to meet the standards and criteria contained herein. All airfield improvement programs or new airfield construction projects are to utilize these criteria. Improvement of existing airfields is to be considered prior to initiation of requests for the construction of new airfields. Construction of new airfields within a 25 kilometer radius of any existing airfield requires full justification and a waiver approved by this headquarters. Requests are to be forwarded to this headquarters, ATTN: MACDC.

b. The standards and criteria established herein are the minimum essential for safe aircraft operations. In specific cases where these criteria cannot be me because of physical factors or excessive costs, a request for waiver is to be forwarded through the component commander to this headquarters, ATTN: MACDC-BD. The request for waiver is to be adequately explained in detail and fully justified. The approval of waivers is to be on a case-by-case basis. Component services are responsible for insuring that airfields under their jurisdiction are in compliance herewith or that required waivers have been obtained or requested. Waivers or requests for waivers, if applicable, are t be permanently filed with the organization operating and maintaining the airfield and are to be renewed annually.

*This directive supersedes MACV Directive 415-9, 12 April 1969.

c. The anticipated density of aircraft traffic determines the amount of effort that is to be put into a particular airfield. An airfield used for sustained operations is to have an asphalt or concrete surface. Likewise, an airfield used for sustained operations is to be large enough for safe and efficient aircraft operations. On the other hand, over-design of individual aircraft facilities could reduce the number of operational facilities which can be built in a given time with available construction resources. The optimum design provides adequate airfield size and strength using minimum construction resources.

d. If possible, a separate rotary wing landing and hovering area is to be established (see Annex B). To permit simultaneous operations of rotary and fixed wing aircraft, it is desirable that the rotary wing landing and hovering area be no closer than 250 feet from the edge of the runway, taxiway, or turnaround, if sufficient real estate is available and construction costs are reasonable. Under no circumstances is the area to be closer than 120 feet.

4. AIRFIELD CLASSIFICATION. To evaluate the airfield density/construction effort factors and to provide safe and efficient airfield operations, airfields are to be classified into three types:

a. Type 1 (Minimum Operational). The lowest standard of construction using the absolute minimum criteria. Operations are to be marginal, inefficient, and limited to daylight and good weather conditions. Allowable cabin loads (ACL) are to be reduced depending on runway surfaces and density altitude. Type 1 airfields are designed to be used as assault airfields and routine resupply airfields for small units (such as Special Forces camps) when time is not a critical factor. Type 1 airfields may be used as a drop zone (DZ) when the delivery of large loads is required or the combat environment requires aerial delivery modes. Type 1 airfields using one of the prescribed surfaces are to sustain approximately 700 traffic cycles (takeoff and landing) without major repair.

Type 1 Surfaces

C-7	C-123	C-130
Clay	Clay	Clay
Laterite	Laterite	Laterite
Limestone	Limestone	Limestone
Sod		M8A1

b. Type 2 (Limited Operational). The minimum construction requirement for sustained operations with the capability to expand to adverse weather and night operations with the addition of lighting and/or instrument approaches, surrounding terrain permitting. Type 2 airfields are to have a ramp capability to handle at least three of the largest type aircraft for which the airfield is designed. ACL may be reduced depending on runway surface and density altitude. Type 2 airfields are to be capable of sustaining 4,000 traffic cycles (takeoff and landing) without major repair.

Type 2 Surfaces

C-7	C-123	C-130
Limestone	Limestone	Limestone
Concrete	Concrete	Concrete
Asphalt	Asphalt	Asphalt
AM 2	AM 2	AM 2
Double Bituminous	Double Bituminous	Double Bituminous
MX 19	MX 19	MX 19
T 17	T 17	
PSP	PSP	
PAP	PAP	
M8A1	M8A1	
Laterite		
Gravel		
Cinders		

c. Type 3 (Fully Operational). The minimum construction requirement for 24-hour constant operations during adverse weather and night operations. Type 3 airfields are to be constructed in accordance with this publication. Type 3 airfields are to maintain the capability of providing full services including refueling, base operations, weather advice, transient alert, 24-hour messing, control tower, and transient ramp space for at least 3 aircraft of the largest size for which the airfield is designed. Type 3 airfields are to be capable of sustaining 15,000 traffic cycles (takeoff and landing) without major repair.

Type 3 Surfaces
(For all types of aircraft)

Asphaltic concrete	AM 2
Rigid concrete	MX 19

5. CRITERIA. Annex C specifies RVN airfield criteria for non-Director of Air Bases (DAB) airfields by airfield classification. For specific criteria applicable only to airfields which are the property of the DAB, RVN, see Annex D. Where criteria and/or data published in this directive conflicts with any of the references in paragraph 7, below, this directive governs.

a. Surface. Runway and taxiway surfaces are to have no holes, ruts, soft spots, loose rocks, or other objects which could cause loss of control during takeoff, landing, or taxiing. The surfacing selected is dependent on many factors such as material availability, expedience required to update or construct an airfield, traffic cycles, and weather. Rigid concrete surfaces are not to be constructed without special consideration and approval from this headquarters. If a hole, rut, soft spot, loose rock, or other object cannot be repaired or removed immediately it is to be marked as outlined in paragraph 5c(4), below. Annex E provides guidance for selecting surfacing other than a bituminous mixture

based upon the California Bearing Ratio (CBR) or Airfield Index attained. When metal paneling is used, it is to be placed over a smoothly graded, compacted surface. Paneling is also to be anchored to preclude shifting.

b. Subsurface. In constructing all season capable runways in the RVN special attention is to be given to the following:

(1) The subgrade is to be investigated to insure the absence of underground water.

(2) Base and subbase courses are to be compacted to the appropriate CBR value, and the surface of the base course is to be sealed, particularly where metal paneling is used.

(3) When metal paneling is installed, it is not to be laid over wet subgrades or the resulting pumping action will soon result in runway failure. Two subgrade surface techniques have been successful in the RVN. These are:

(a) Placement of 4 to 6 inches finished thickness soil-cement base course using the volume 15 to 22% Portland cement, 48 to 55% laterite, and 30% sand admix.

(b) Placement of 4 to 6 inches finished thickness of well graded, well compacted crushed rock or gravel based course. Gradation is to be such as to provide filler restraint for fine graded soils.

(4) Runway transverse grades are to provide for quick disposal of surface water. To facilitate surface drainage, transverse grades of shoulders are to always be greater than transverse grades of the adjacent runway, taxiway, or apron by at least 1%. The minimum shoulder gradient is 1.5%.

(5) The longitudinal gradients for all types of airfields are to be correlated to the maximum gradient changes in relation to sight distances. No appreciable grade change (1.5% maximum) is to be permitted within 500 feet from the ends of the runway. The gradient of the central portion of the runway is to be as follows: when grade changes cannot be avoided, there is to be an unobstructed line of sight from any point five feet above the runway within a distance of 3,000 feet.

(6) Airfield gradient criteria is as follows:

(a) Runways - Longitudinal: 3% maximum (1.5% first 500 feet).
Transverse: 0.5% - 3%.
Shoulders: 1.5% - 5% and at least 1% greater than adjacent runway.

(b) Runway Clear Zones: 5% maximum.

(c) Taxiway - Longitudinal: 0% - 5%.

Transverse: 0.5% - 5%.
Clear Area: 5% maximum.

(d) Parking Area: 5% maximum.

c. Airfield Markings. The lack of adequate airfield markings contributes to the cause of aircraft accidents. All airfields are to be marked as follows:

(1) Runway Markings. For hard surface runways, (asphalt, concrete, and metal matting), touchdown areas and runway corners are to be marked with white paint. On unsurfaced runways, where it is not feasible to paint the markings, fabricated markers, painted white, are to be used to indicate ends of runway and touchdown areas (see Annex E). Further, if the runway edge is not discernible, painted sandbags, or other material is to be placed along the runway edge at 300 foot intervals to indicate the traffic area boundary. If it becomes necessary to temporarily displace the threshold due to unserviceable runway conditions, the temporary threshold should be marked in accordance with the instructions furnished in Annex F.

(2) Fire Pots for Night Lighting. For airfields not equipped with proper lighting and where night operations are required, fire pots are to be provided. Fire pots are to be fabricated from 55 gallon drums and are to be 18 inches deep with a 10 inch square opening in the top. They are to be placed in the ground so that the top is a maximum of 6 inches above ground level. They are to be 10 feet from the runway edge and at 250 foot intervals (see Annex F).

(3) Wind Socks. A 15 knot wind sock is to be provided approximately in the middle of the runway at the outer edge of the lateral safety zone. The wind sock is to be in full view from the entire runway. Rocks, matting, or other material, painted white, are to be placed in a 12 foot diameter circle around the wind sock pole to assist in locating the wind sock from the air.

(4) Obstacles. Craters, holes, or other obstacles in the immediate vicinity of the runway may endanger safe ground operation of aircraft. If they cannot be repaired or removed immediately they are to be marked as outlined below. Where a relatively small area of runway, taxiway, or overrun has failed or for any reason becomes hazardous for aircraft operations, and it is not intended to close the entire area to operations, the affected area is to be marked with flags for day operations and red lights at night. Flags are to be of red material and not less than 18 inches square. When danger flags are made of fabric, a wire stiffener is to be used to hold the flag in an extended position. Flags are to be mounted so that they do not produce a hazard.

(5) When a runway or taxiway has been closed for any reason, large warning panels are to be laid out on the runway or taxiway in the form of an "X" to indicate an unusable condition. The nearest Tactical Airlift Liaison Officer (TALO) and Combat Operations Center (COC) are to be contacted

immediately when all or part of an airfield is closed. TALO and COC are to relay the information to the 834th Air Division Airlift Control Center (ALCC) for dissemination by Notice to Airmen (NOTAM).

(6) Heliports. Heliports are to be marked by the standard "H", which is to be located a sufficient distance from the touchdown point so that the material used for marking (painted PSP, rocks, or panels) is not loosened by the rotor wash and blown into the rotor system. Landing area outlines are to be lighted for night operation when the tactical situation permits.

d. Other Criteria.

(1) Runway approach zones and lateral safety zones are to be clear of all obstacles which project above the applicable slope.

(2) Runway and taxiway shoulder areas, clear zones, and clear areas are to be clear of obstacles, except those items which are to be maintained in order to meet air navigation and aircraft ground guidance requirements.

(3) All runway lengths are to be adjusted to compensate for altitude, surface material, and grade. Runway lengths are to be increased 7% per 1,000 feet elevation above mean sea level.

(4) Technical assistance and guidance for airfield design is provided in references 7a, b, c, and e, below. It is reemphasized that in the event of conflicting data, this directive is to govern.

6. REPORTS. This directive requires no report.

7. REFERENCES.

a. TM-5-330

b. TM-5-366

c. TM-5-827-2 (AFM 88-24)

d. TM-11-2557-26

e. EM 1110-45-302 (Chapter 2 AFM 88-6)

f. OPNAVINST 3722.16A

g. AFM 55-9

h. MACV Dir 95-9

FOR THE COMMANDER:

ELIAS C. TOWNSEND
Major General, USA
Chief of Staff

LOUIS J. PROST
Colonel, USA
Adjutant General

Annexes:
A. Minimum Airfield Criteria for OV-10 Aircraft
B. Rotary Wing Landing Area
C. RVN Airfield Criteria (non-DAB Airfields)
D. RVN Airfield Criteria (DAB Airfields)
E. Surface Selection
F. Airfield Markings

DISTRIBUTION:
IV-B
II-C, III-C
Plus:
100 - MACDC-BD
5 - MACJ3
10 - MACIG
10 - USAID (CAAG)
20 - DAB, RVN
150 - MACAG-AP
2 - MACAG-AO

MINIMUM AIRFIELD CRITERIA FOR OV-10 AIRCRAFT

1. Minimum Runway Length.

Field Elevation	Length (in feet)
Sea level	2,850
1,000 ft MSL	3,050
2,000 ft MSL	3,250
3,000 ft MSL	3,450
4,000 ft MSL	3,650
5,000 ft MSL	3,850

2. Minimum Runway Width. The minimum runway width for OV-10 aircraft operations is 45 feet; however, consideration is to be given to the type of supporting aircraft (C-123, C-130) which are to be utilized to support the airfield prior to establishing the width of the runway.

3. Runway Surface. The runway surface is to have no holes, ruts, soft spots, loose rocks, or other objects which could cause loss of control of the aircraft during takeoff or landing.

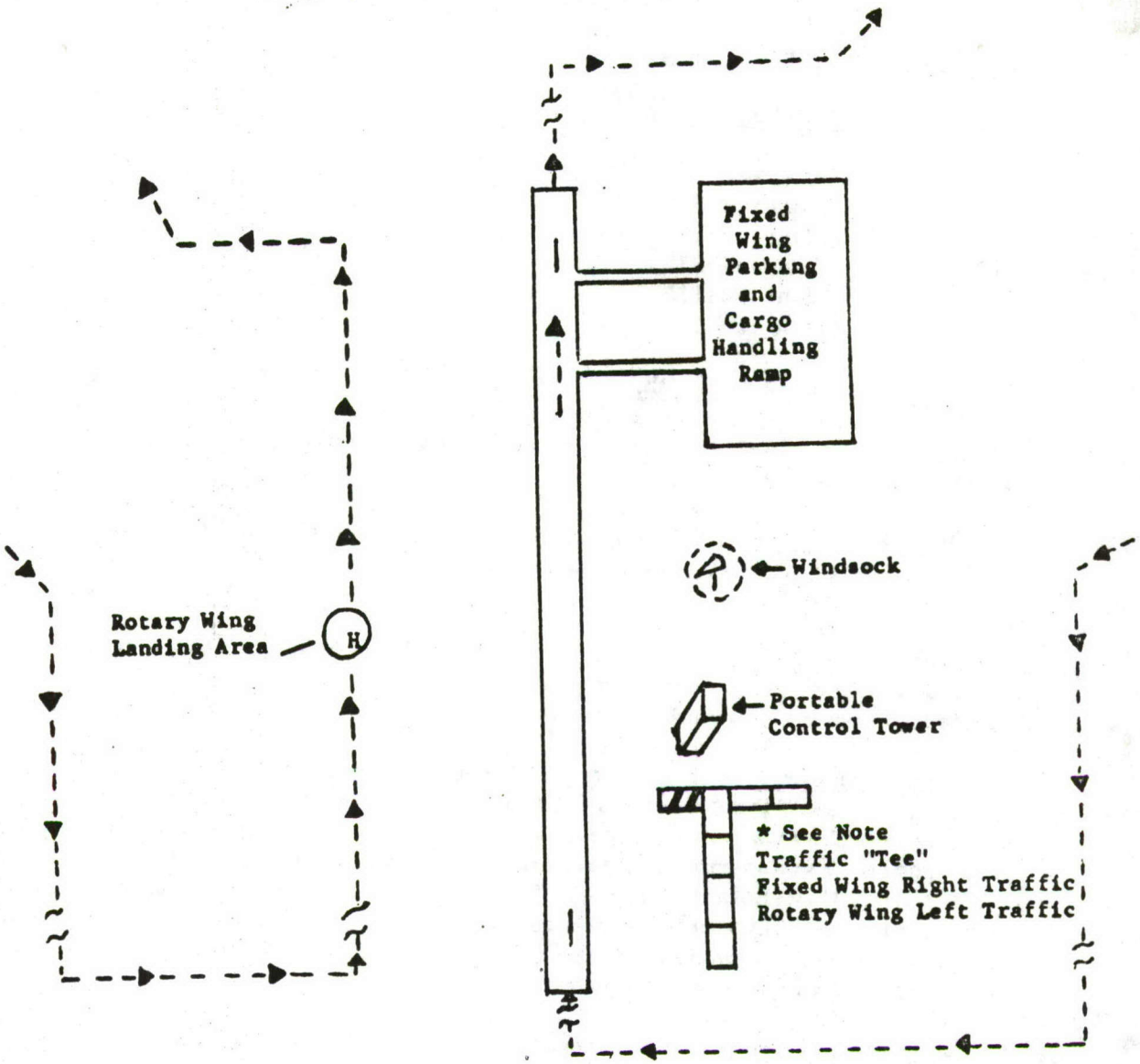
4. Runway Side Clearance. Both sides of the runway are to be cleared of all obstacles out to a distance of 30 feet. Excess runway width (over 45 foot minimum) may be applied to obtain the required runway side clearance.

5. Approach and Departure Zones. Approach and departure zones are to be cleared of obstacles from the threshold (approach and departure ends) in line with the runway heading and above a 3 degree reference line out to a distance of 1,000 feet (approximately 20:1 slope). Excess runway length over the minimum required may be applied to obtain the required threshold clearance. If the overrun was used in computing minimum runway criteria then obstacle clearance is to be measured from the end of the overrun. The approach and departure zones are to have a minimum lateral clearance of 45 feet on either side of the runway centerline.

6. Airfield Markings. For C-130 aircraft airfield markings are to conform to the criteria established in Annex F of this directive.

Annex A

ROTARY WING LANDING AREA



*NOTE: Stem of "T" is to be 20' long (4 ea 5 foot sections). The arm of the "T" representing direction of fixed wing traffic is to be 10' long (2 ea 5 foot sections). The arm of the "T" representing rotary wing traffic is to be 5' long (1 ea 5 foot section) and painted with alternating stripes of contrasting colors.

Annex B

RVN AIRFIELD CRITERIA (Non-DAB Airfields)

(Applicable to all Airfields except those listed in Annex D)

TYPE 1 AIRFIELDS

RUNWAY	C-130	C-123	C-7
Length	2500'	2000'	1000'
Width	60'	50'	50'
Shoulder	10'	10'	10'
Clear Area	35'	35'	35'
Lateral Safety Zone	60'	50'	40'
Lateral Safety Zone Slope	7:1	7:1	7:1

RUNWAY CLEAR ZONE			
Length	300'	300'	300'
Beginning Width	150'	150'	150'
Flares to	225'	225'	225'

RUNWAY APPROACH ZONE			
Length	5280'	2000'	2000'
Beginning Width	225'	225'	225'
Flares to	2000'	750'	750'
Slope	35:1	25:1	20:1

TURNAROUNDS			
Length	150'	150'	100'
Width	150'	150'	100'
Shoulder	10'	10'	10'
Clear Area	35'	35'	35'
Lateral Safety Zone	60'	50'	40'
Lateral Safety Zone Slope	7:1	7:1	7:1

OVERRUNS			
Length	100'	100'	100'
Width	60'	50'	50'

TAXIWAYS	C-130	C-123	C-7
Length*	195'	195'	195'
Width	40'	40'	40'
Turn Radius	70'	70'	70'
Clear Area	65'	65'	65'
Shoulder	10'	10'	10'

PARKING APRON AREA**			
Length	210'	210'	150'
Width	210'	210'	150'
Shoulder	10'	10'	10'
Clear Area	65'	50'	50'
Cargo Area	45'	45'	45'

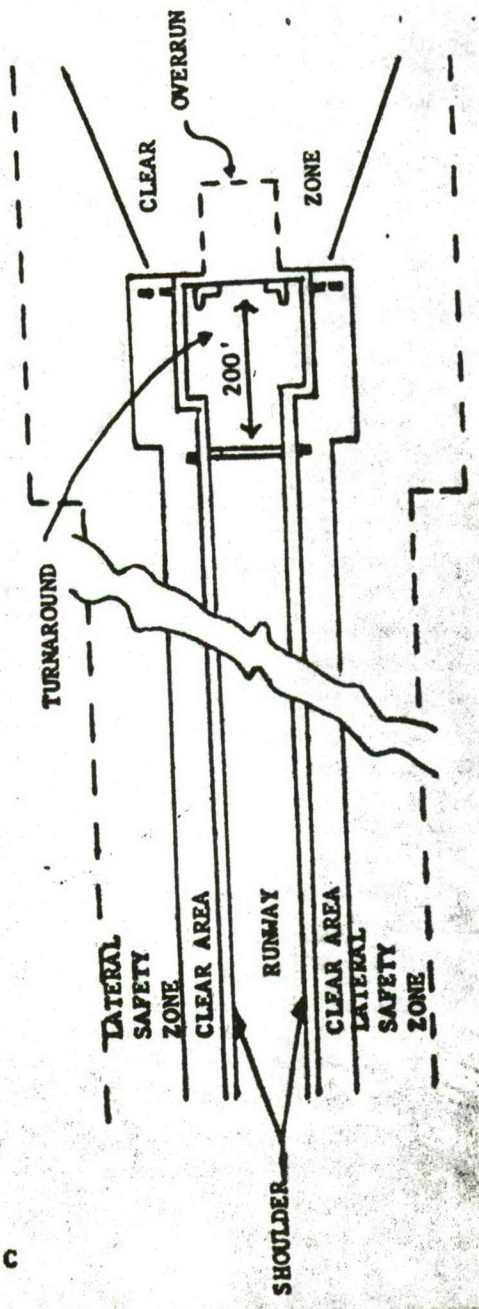
* Runway-to-apron minimum distance

** See Type 2 Criteria for layout. A parking apron is not required except for airfields serving as normal resupply or POL points.

Annex C

TYPICAL LAYOUT

TYPE 1 AIRFIELD



TYPE 2 AIRFIELDS

RUNWAY	C-130	C-123	C-7
Length	2900'	2300'	1500'
Width	60'	60'	60'
Shoulder	10'	10'	10'
Clear Area	35'	35'	35'
Lateral Safety Zone	75'	75'	75'
Lateral Safety Zone Slope	7:1	7:1	7:1

TAXIWAYS	C-130	C-123	C-7
Length*	245'	195'	195'
Width	40'	40'	40'
Turn Radius	70'	70'	70'
Clear Area	65'	65'	65'
Shoulder	10'	10'	10'

RUNWAY CLEAR ZONE			
Length	500'	400'	400'
Beginning Width	150'	150'	150'
Flares to	300'	300'	300'

PARKING APRON AREA			
Length	750'	450'	450'
Width	210'	210'	150'
Shoulder	10'	10'	10'
Clear Area	65'	60'	50'
Cargo Area	45'	45'	45'

RUNWAY APPROACH ZONE			
Length	7920'	3000'	3000'
Beginning Width	300'	300'	300'
Flares to	2000'	850'	850'
Slope	35:1	25:1	20:1

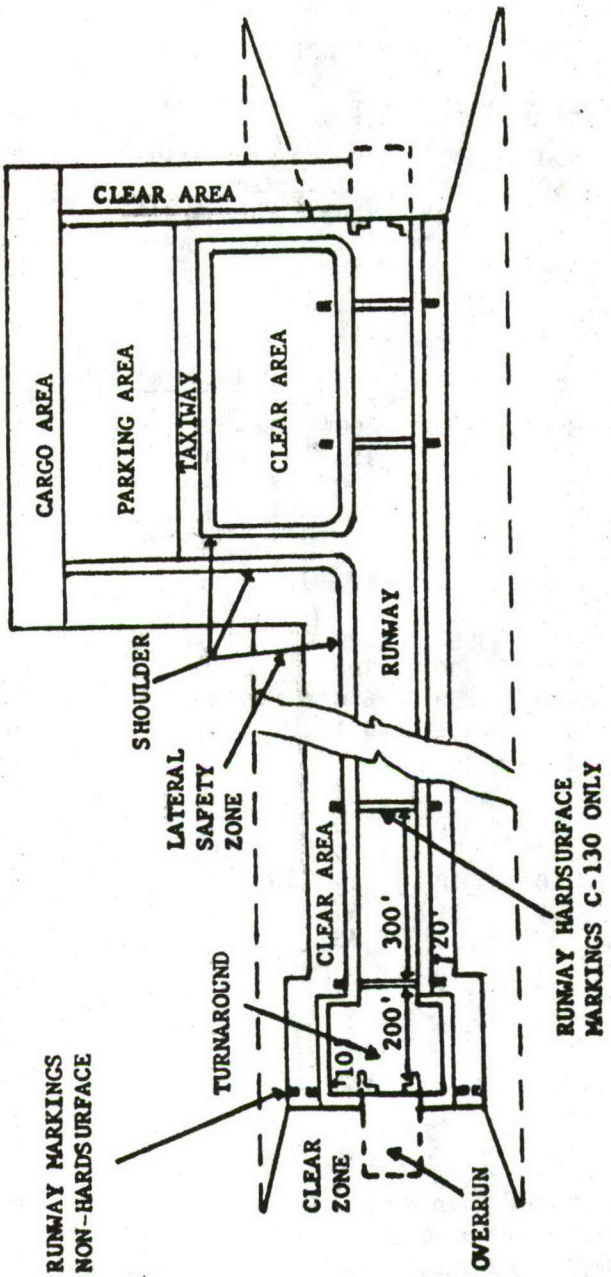
TURNAROUNDS			
Length	150'	150'	150'
Width	150'	150'	150'
Shoulder	10'	10'	10'
Clear Area	35'	35'	35'
Lateral Safety Zone	35'	35'	35'
Lateral Safety Zone Slope	7:1	7:1	7:1

OVERRUNS			
Length	100'	100'	100'
Width	60'	60'	60'

* Runway-to-apron minimum distance. POL taxiways are to use 245' from runway with 150' x 150' turnaround or back edge of ramp adjacent to cargo area. Consideration is to be given for extending C-123 and C-7 taxiways to a distance of 245' in order to enable future upgrading to C-130.

TYPICAL LAYOUT

TYPE 2 AIRFIELD



TYPE 3 AIRFIELDS *

(Applicable to all three aircraft types)

RUNWAY	
Length	3500'
Width	60'
Shoulder	10'
Clear Area	35'
Lateral Safety Zone	75'
Lateral Safety Zone Slope	7:1

RUNWAY CLEAR ZONE	
Length	500'
Beginning Width	150'
Flares to	500'

RUNWAY APPROACH ZONE	
Length	(**)
Width	500'
Flares to	2500'
Slope	(**)

TURN AROUNDS	
Length	150'
Width	150'
Shoulders	10'
Clear Area	35'
Lateral Safety Zone	35'
Lateral Safety Zone Slope	7:1

OVERRUNS	
Length	300'
Width	60'

TAXIWAYS	
Length***	245'
Width	40'
Turn Radius	70'
Clear Area	65'
Shoulder	10'

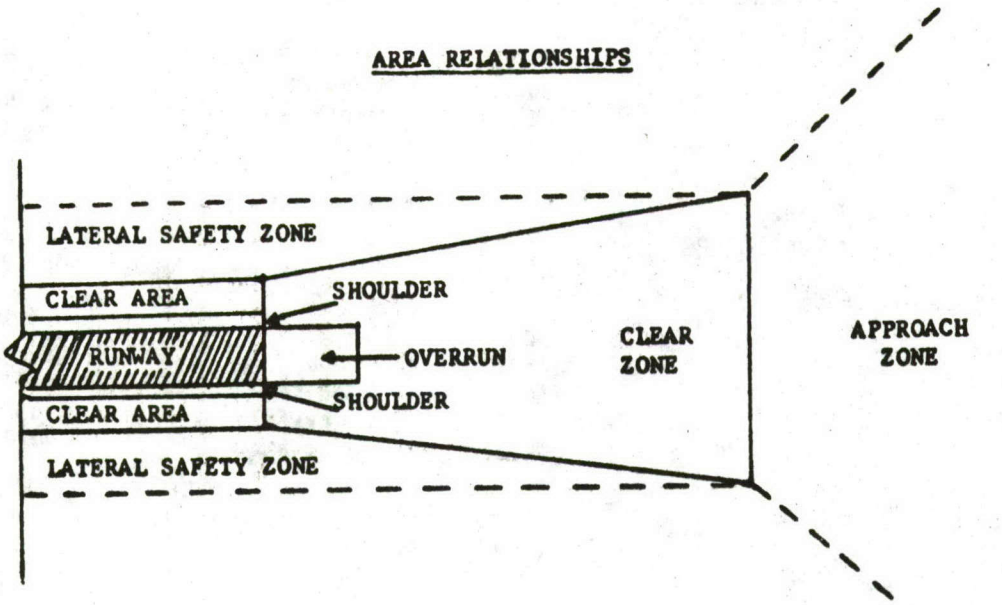
PARKING APRON AREA	
Length	900'
Width	210'
Shoulder	10'
Clear Area	65'
Cargo Area	45'

* For layout, see page 4 of Annex C

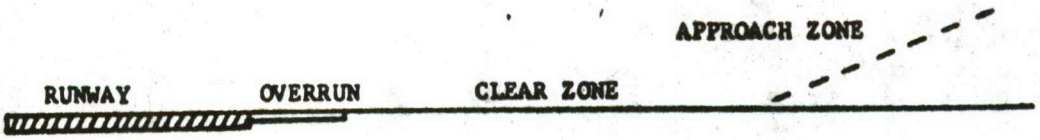
** The length and slope of Type 3 runway approach zones are to meet criteria for the particular instrument approach planned for that aircraft. See US Standards for Terminal Instrument Procedure (TM 11-2557-26, OPNAVINST 3722.16A, AFM 55-9).

***Runway-to-apron minimum distance.

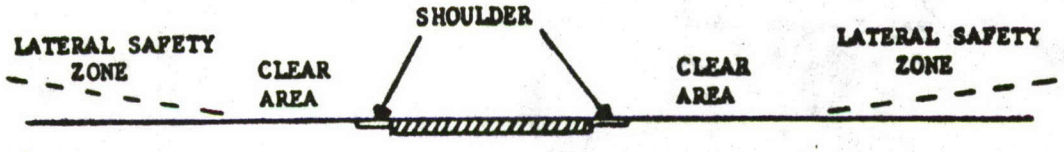
AREA RELATIONSHIPS



PLAN VIEW



LONGITUDINAL SECTION



TRANSVERSE SECTION

RVN AIRFIELD CRITERIA
(Directorate of Air Bases Airfields)

1. Attached as Appendix 1 is a list of airfields which are the property of the DAB, RVN. All major repair work or construction programs at locations listed are to be coordinated with the DAB, RVN, through Headquarters, MACV, ATTN: MACDC prior to accomplishment. When the work necessitates the closing of the runway or causes interruption of airport operations for a period not exceeding three days, ten days prior notification is required. When the work is to affect airport operations in excess of three days, thirty days prior notification is required. The detailed schedule of work indicating what areas of the airport are to be involved for what periods of time is to be forwarded not later than ten days prior to the starting date. For normal maintenance and repair work, see MACV Directive 420-1.

2. When master planning over-all development, or when planning specific projects, the criteria of the DAB contained in Appendix 2 is to be applied. The criteria in Annex A does not apply. Plans are to be submitted to Headquarters, MACV, ATTN: MACDC-BD at the earliest practical date prior to initiation of work. Submittal may be made by letter or message. Include a brief description of existing conditions, scope of proposed work, and starting and completion dates, including a phasing schedule, if applicable. When the concurrence of the DAB, RVN, has been received, this headquarters is to notify the requesting organization.

3. Upon completion of the work, as-built drawings indicating the airfield layout and a cross section of the airfield surface and subsurface, is to be forwarded to Headquarters, MACV, ATTN: MACDC-BD for the records of the DAB, RVN.

Annex D

AIRFIELDS IN VIETNAM UNDER THE ADMINISTRATIVE CONTROL OF THE DIRECTORATE OF AIR BASES, RVN

A/D NUMBER	PRIMARY NAME	ALTERNATE NAME	EQUAL TO MACV TYPE	DAB CAT
VA 1-6	Hue/Phu Bai	Hue	III	E
VA 1-22	Dong Ha		II C-130	G
VA 1-23	Quang Ngai		I C-123	F
VA 1-40	Tam Ky		II C-130	G
VA 1-45	Kham Duc	Khan Duc Dak Nhe'	Not Used	G
VA 1-79	Quang Tri I	Quang Tri North Nhan Bieu Riverside	Not Used	H
VA 2-8	Dalat/Cam Ly	Con Tach Tria Cam Ly	II C-130	G
VA 2-9	Dalat/ Lien Khuang	Fimnon Lien Khuong	II C-130	G
VA 2-11	Phan Thiet	Phung Duc	II C-130	G
VA 2-12	Ban Me Thuot East		II C-130	F
VA 2-13	Qui Nhon		III	F
VA 2-15	Kontum		II C-130	G
VA 2-21	Nhon Co		II C-130	G
VA 2-28	Phan Rang	Buu Son Luan Thanh Thap Cham Bun Son	III	A
VA 2-34	Dak To II	Kon Hojao West Dak To	II C-130	G

Appendix 1 to Annex D

A/D NUMBER	PRIMARY NAME	ALTERNATE NAME	EQUAL TO MACV TYPE	DAB CAT
VA 2-46	Cung Son		I C-130	H
VA 2-83	Ba Ngoi	Trai Ca Ba Ngoi/Trai Ca	Not Used	Closed
VA 2-87	Hoai Nhon	Bong Son Two Bits	Not Used	H
VA 2-91	Duc Co	Chudron	II C-130	G
VA 2-100	M'Draok		Not Used	H
VA 2-108	Son Cau		I C-7	H
VA 2-113	Tuy Hoa	Tuy Hoa Nam Tuy Hoa South Dong Tac	III	A
VA 3-1	Tan Son Nhut	Saigon	III	A
VA 3-30	Song Be	Nui Bara	II C-130	G
VA 3-50	Phuoc Vinh	Phuoc Thanh Phuoc Hoa New Bung Bung	II C-130	G
VA 3-132	Ham Tan	Song Phan	II C-130	H
VA 3-133	Binh Long	Hon Quan	II C-7	H
VA 3-151	Tay Ninh	Tay Ninh City Tay Ninh I	II C-7	H
VA 3-153	Thu Dau Mot	Phu Loi Phu Cuong Phu Hoa	I C-130	G
VA 3-159	Vo Dat	Vo Dat I	II C-130	G
VA 3-162	Xuyen Moc		Not Used	H
VA 3-256	Tay Ninh West	Tay Ninh III Trang Lon	II C-130	G

A/D NUMBER	PRIMARY NAME	ALTERNATE NAME	EQUAL TO MACV TYPE	DAB CAT
VA 4-10	Quan Long	Quan Long 2 Ca Mau Ca Mau Moi Ca Mau (New)	II C-123	G
VA 4-14	Truc Giang	Ben Tre Kien Hoa Son Dong Song Dong	II C-123	G
VA 4-17	Can Tho	Can Tho (Old) Phong Dinh	II C-123	F
VA 4-20	Vinh Long		I C-123	G
VA 4-26	Ben Tranh	Tam Hiep Tan Hei Tan Hiep My Tho	I C-7	H
VA 4-32	Con Son	Poulo Condore	II C-130	G
VA 4-33	An Long		II C-123	G
VA 4-36	Ha Tien		Not Used	H
VA 4-38	Thuy Dong	Tayen Nhon Tuyen Nhon	II C-7	H
VA 4-51	Moc Hoa	Go Bac Chien	II C-123	G
VA 4-52	Tra Vinh	Phu Vinh	II C-130	G
VA 4-53	Cao Lanh	Tan Tich	I C-7	H
VA 4-57	Quan Long City	An Xuan Cu Ca Mau (Old) An Xuyen Quan Long I	Not Used	H
VA 4-165	Duong Dong	Phu Quoc	II C-130	G
VA 4-166	Hon Chong	Cement Plant	II C-7	H

A/D NUMBER	PRIMARY NAME	ALTERNATE NAME	EQUAL TO MACV TYPE	DAB CAT
VA 4-167	Kien Giang	Rach Gia Rach Gia New Rach Soi	II C-123	G
VA 4-168	Long Toan		Not Used	G
VA 4-169	Long Xuyen	An Giang Ap Long Thanh My Thoi	II C-123	G
VA 4-175	Vi Thanh (Old)	Vi Thanh 2	Not Used	Closed
VA 4-193	Chau Duc	Chau Doc Chau Phu	II C-7	"
VA 4-225	Vi Thanh	Vi Thanh New	I C-123	G

DAB CATEGORY	A	B	C	D	E	F	G	H
Runway Length	8400'+	7000'-8400'	5900'-7000'	5000'-5900'	4200'-5000'	3500'-4200'	3000'-3500'	3000'
(1) Min Width	150'	150'	150'	150'	150'	100'	100'	83'
Separation of Parallel Runways	700'	700'	700'	500'	500'	500'	500'	
(2) Max Longitudinal Slope	1.25%	1.25%	1.25%	1.5%	1.5%	1.5%	1.5%	1.5%
Max Transverse Slope (3)	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Instrument R/W Clear Area Width	500' from center line of runway----------							
Non-Instrument R/W Clear Area	250' from center line of runway----------							
Max Clear Area Slope	1.75%	1.75%	1.75%	2%	2%	2%	2%	2%
Transition of Surface Slope	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%
Overrun Length	200'	200'	200'	200'	200'	200'	200'	200'
Instrument R/W Overrun Width	500' from extended center line of runway----------							
Non-Instrument R/W Overrun Width	250' from extended center line of runway----------							
Max Overrun Slope	1.25%	1.25%	1.25%	1.5%	1.5%	1.5%	1.5%	1.5%
Min Taxiway Width	5'	75'	75'	75'	50'	50'	50'	50'
Distance Between Instrument Runway and Taxiway	490'	490'	490'	490'	490'	475'	475'	475'
Distance Between Non Instrument Runway and Taxiway	240'	240'	240'	240'	240'	225'	225'	225'
Distance Between Taxiways	170'	170'	170'	170'	140'	140'	130'	130'
Distance from Taxiway to Any Fixed Obstruction	100'	100'	100'	100'	85'	85'	80'	80'

Continued on next page

DAB CATEGORY	A	B	C	D	E	F	G	H
Maximum Taxiway Longitudinal Slope	1.5%	1.5%	1.5%	1.5%	3%	3%	3%	3%
Maximum Taxiway Transverse Slope (3)	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%

(1) Widths of runways constructed prior to date of this publication will be maintained at their current widths only. Runways constructed after date of this publication will be constructed to widths specified in Annex A. Provisions will be made, however, for future widening to the widths specified above.

(2) For runways of category A, B, and C, the first and last quarter lengths will not exceed 0.8%. For all runways, slope changes will be such that there will be an unobstructed line of sight from any point 10' above the runway to all other points 10' above the runway within a distance of one half the length of the runway.

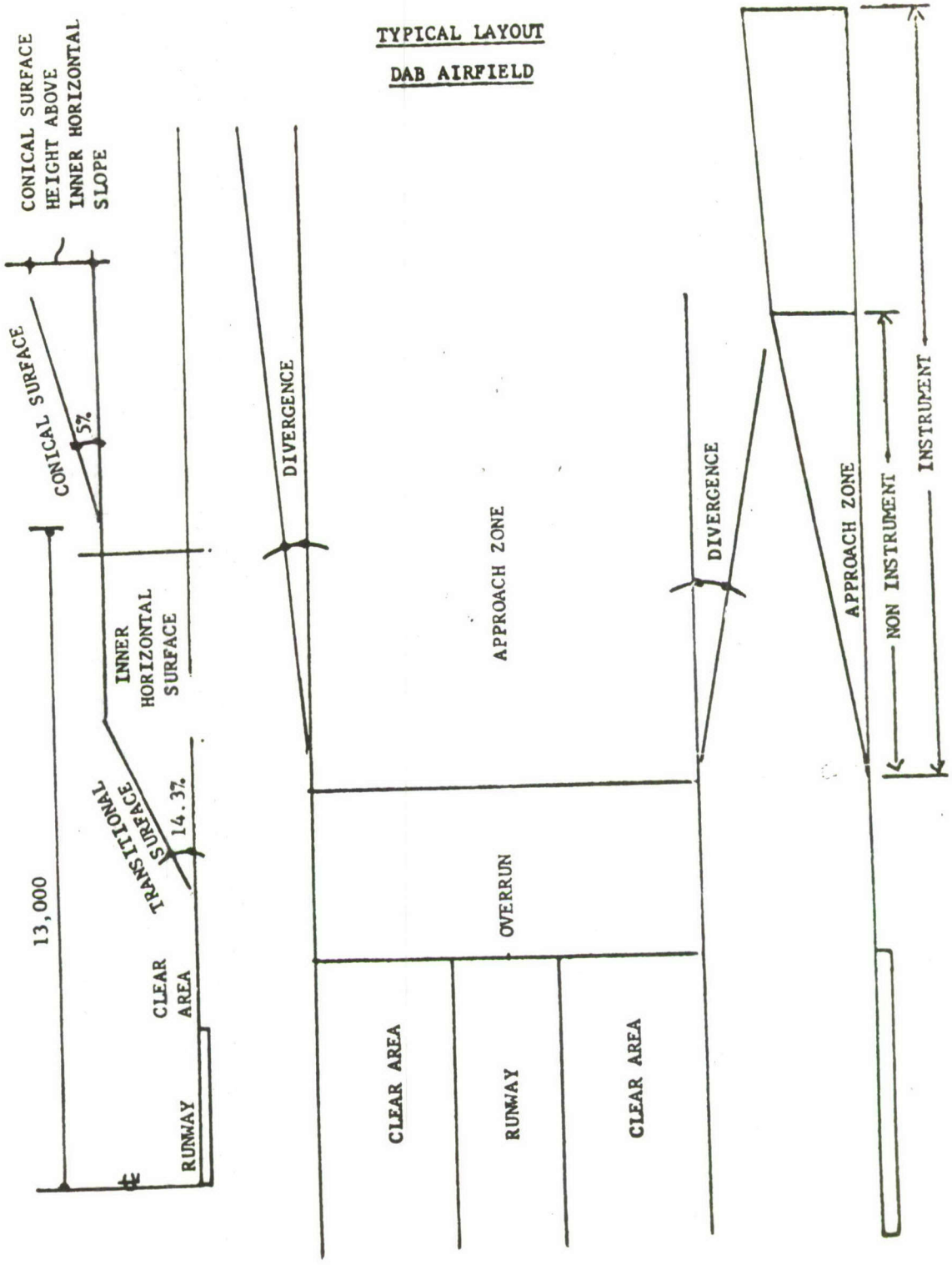
(3) For runway and taxiway transverse slopes, the following criteria are recommended according to different types of surfaces.

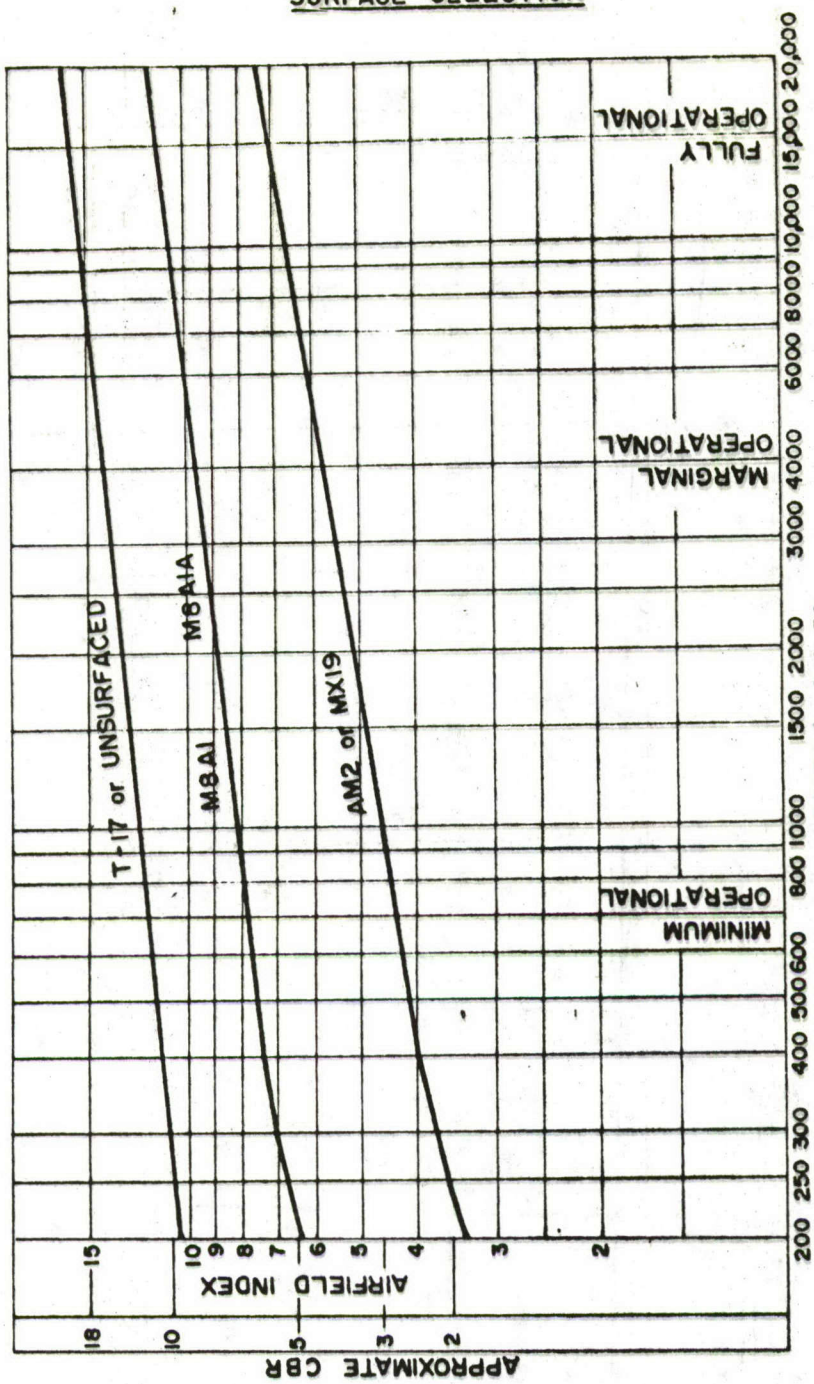
For concrete, M8A1, AM-2, MX-19, PSP and PAP - Minimum slope 1%, maximum slope 1.5%

For asphalt and double bituminous - Minimum slope 1.5%, maximum slope 2%.

For all other surfaces - Minimum slope 2%, maximum slope 3%.

DAB CATEGORY	A	B	C	D	E	F	G	H	INSTRUMENT A-H
Non-Instrument Approach Zone Width Inner Edge	500'	500'	500'	500'	500'	500'	500'	500'	1000'
Divergence	10%	10%	10%	10%	10%	10%	10%	10%	15%
Length	10,000'	10,000'	10,000'	10,000'	10,000'	10,000'	10,000'	10,000'	50,000'
Slope for Inner 10,000'	2.5%	2.5%	2.5%	2.5%	3.33%	3.33%	4%	4%	2%
Slope Beyond Inner 10,000'									2.5%
Radius of Inner Horizontal Surface	13,000'	13,000'	13,000'	13,000'	13,000'	13,000'	13,000'	13,000'	13,000'
Altitude of Inner Horizontal Surface	150'	150'	150'	150'	150'	150'	150'	150'	150'
Conical Surface Height Above Inner Horizontal Surface	350'	350'	350'	250'	250'	250'	N/A	N/A	350'
Conical Surface Slope	5%	5%	5%	5%	5%	5%	N/A	N/A	5%


TYPICAL LAYOUT
DAB AIRFIELD
CONICAL SURFACE HEIGHT ABOVE INNER HORIZONTAL SLOPE
CONICAL SURFACE
5%
INNER HORIZONTAL SURFACE
TRANSITIONAL SURFACE
14.3%
13,000
CLEAR AREA
RUNWAY
DIVERGENCE
APPROACH ZONE
OVERRUN
CLEAR AREA
RUNWAY
CLEAR AREA
DIVERGENCE
APPROACH ZONE
NON INSTRUMENT
INSTRUMENT

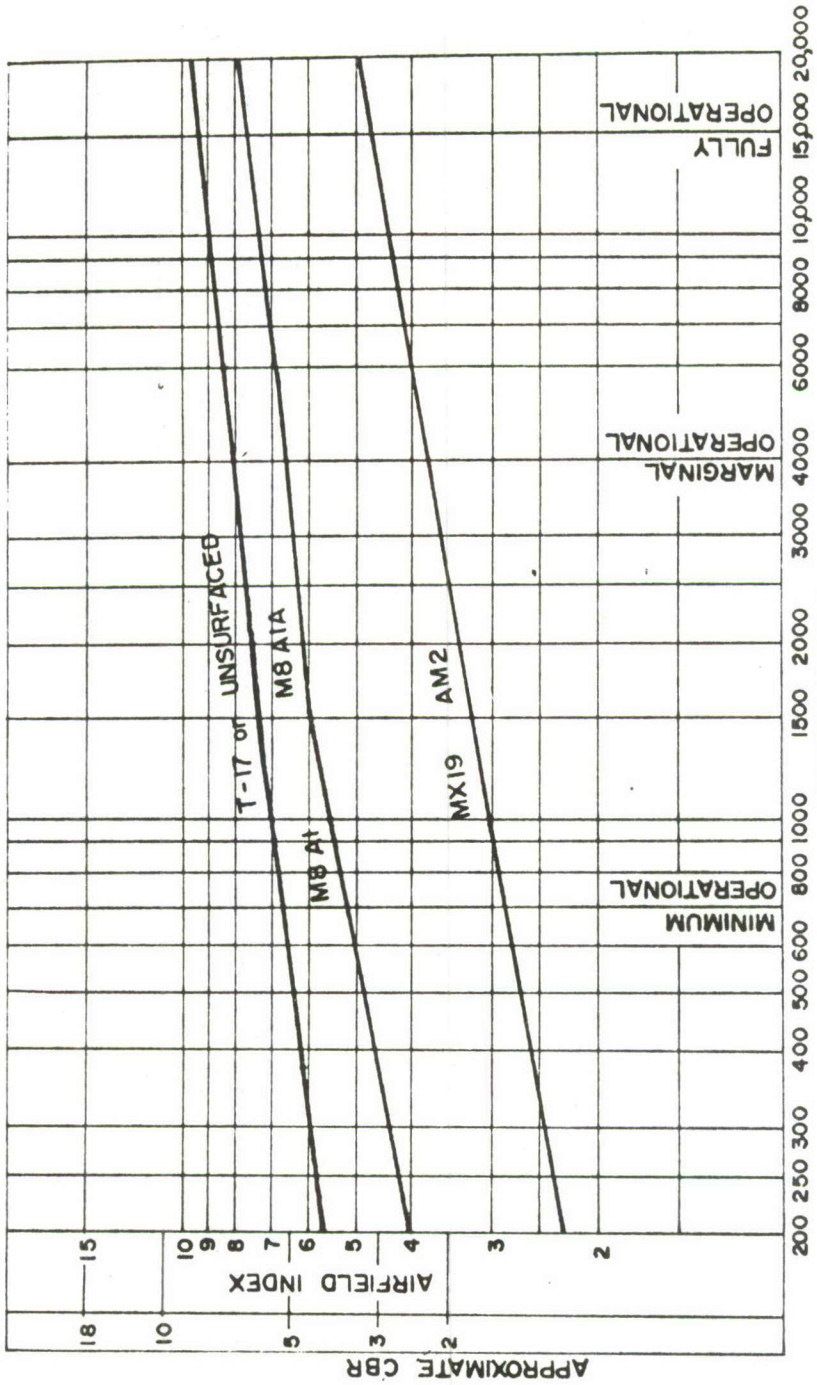


EXTRAPOLATED SUBGRADE STRENGTH REQUIREMENTS

C-130 AIRCRAFT

150,000 LBS. GROSS WEIGHT

ANNEX E

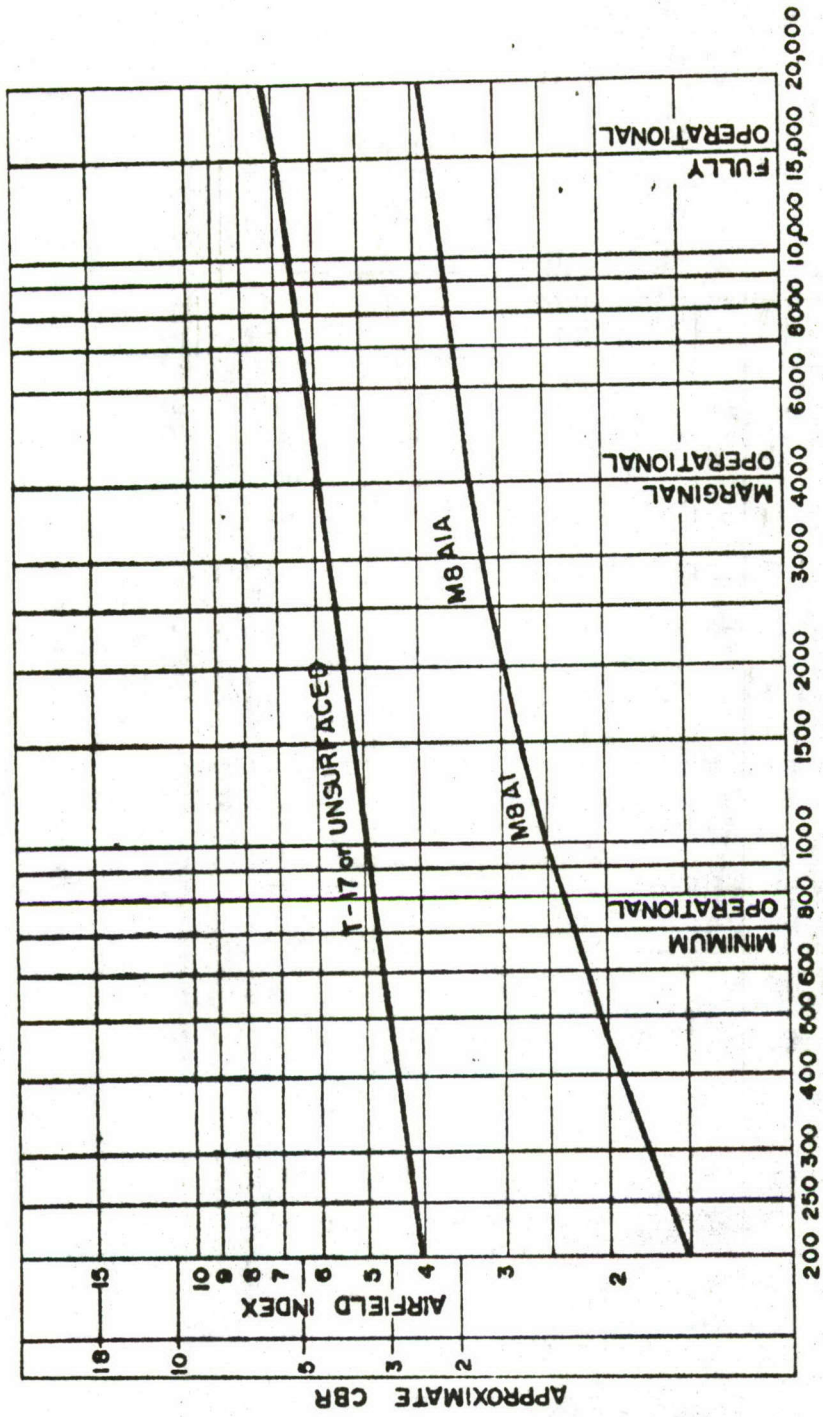


EXTRAPOLATED SUBGRADE STRENGTH REQUIREMENTS

C-123

75,000 LBS. GROSS WEIGHT

PAGE 2 OF ANNEX E



EXTRAPOLATED SUBGRADE STRENGTH REQUIREMENTS

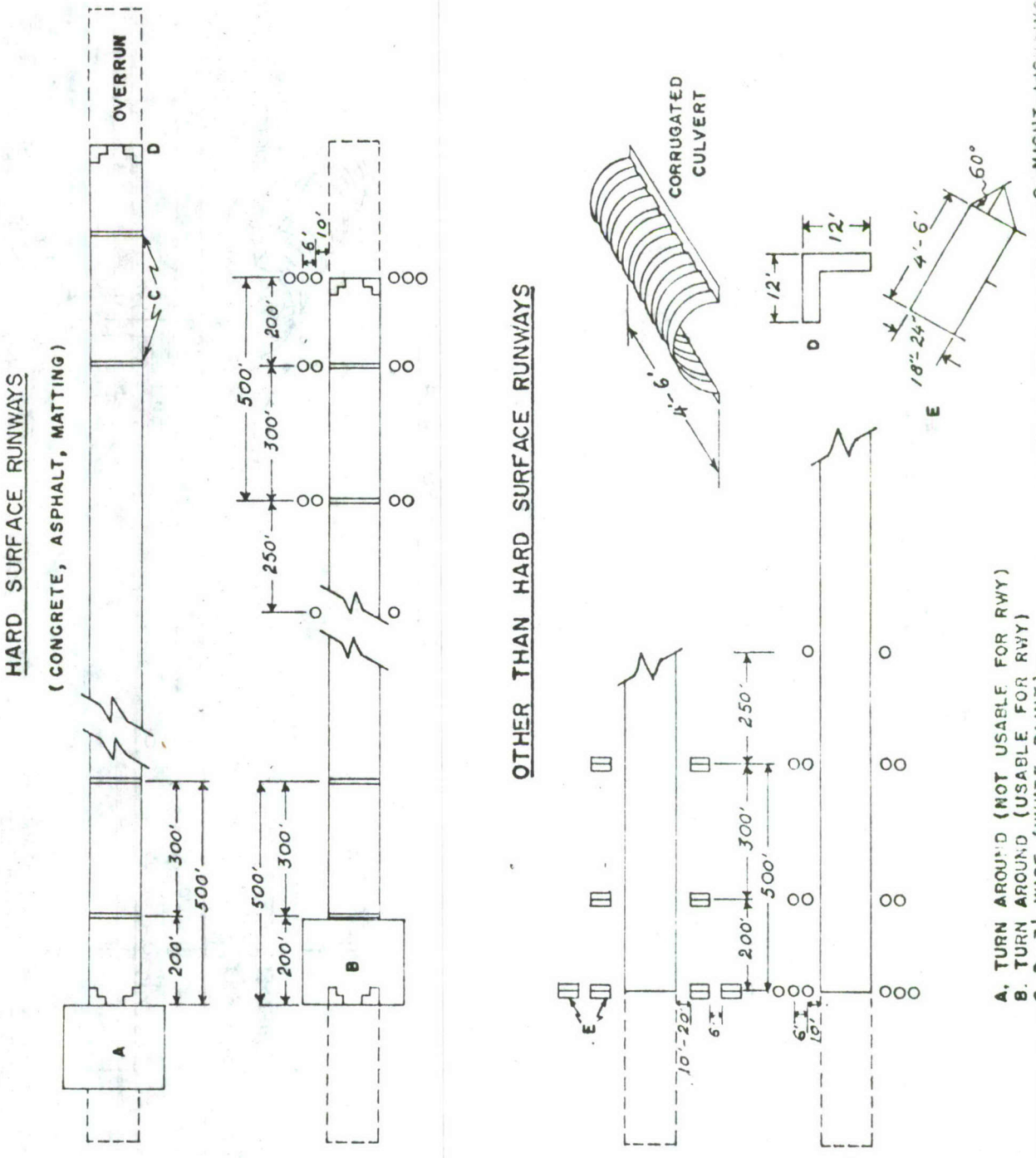
C-7

28,000 LBS GROSS WEIGHT

PAGE 8 OF ANNEX E

RUNWAY MARKINGS AND LIGHTING

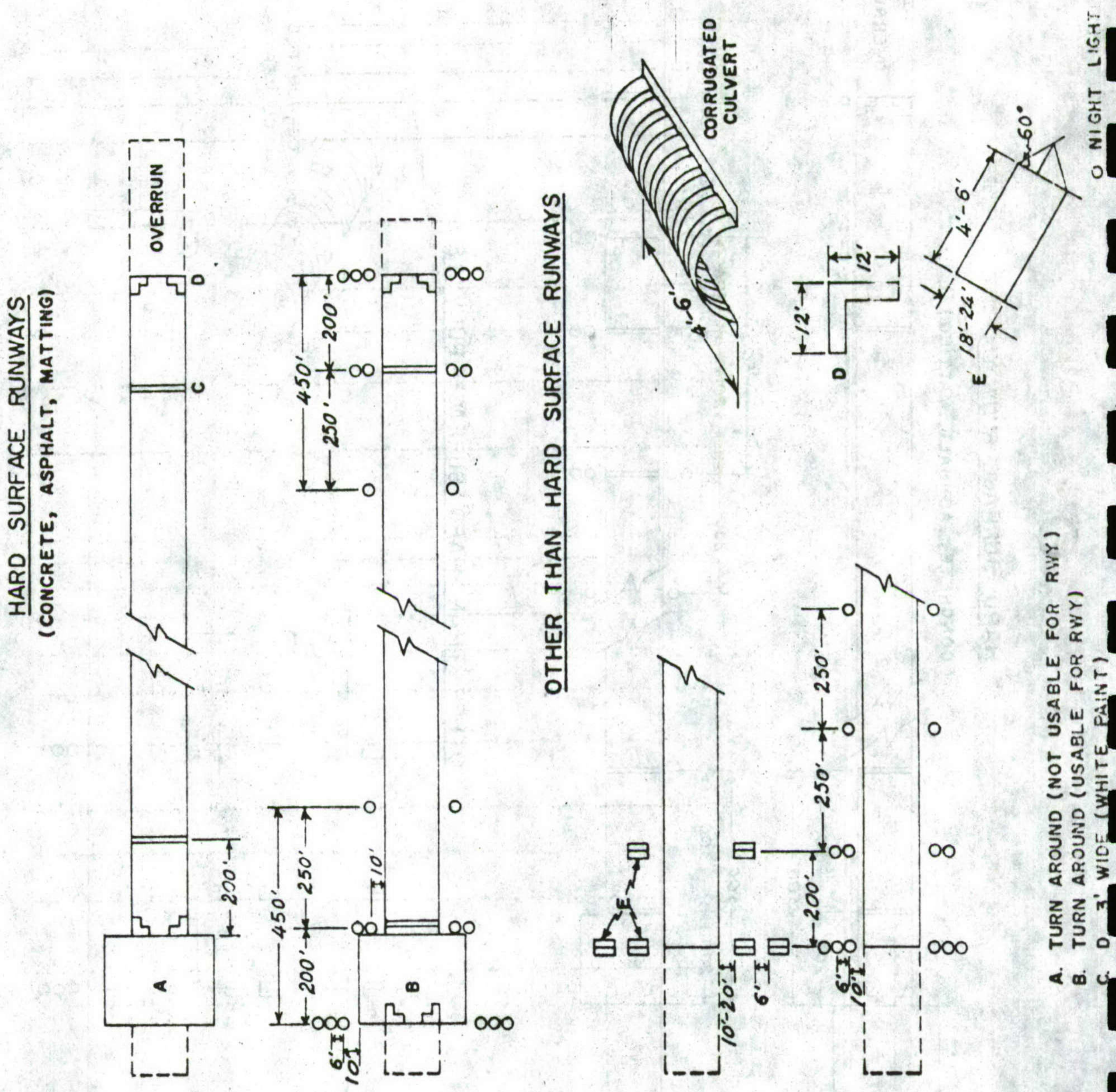
TYPE I, II, III C-130; TYPE III C-123 AND C-7
(LENGTH 2,500' OR LONGER)



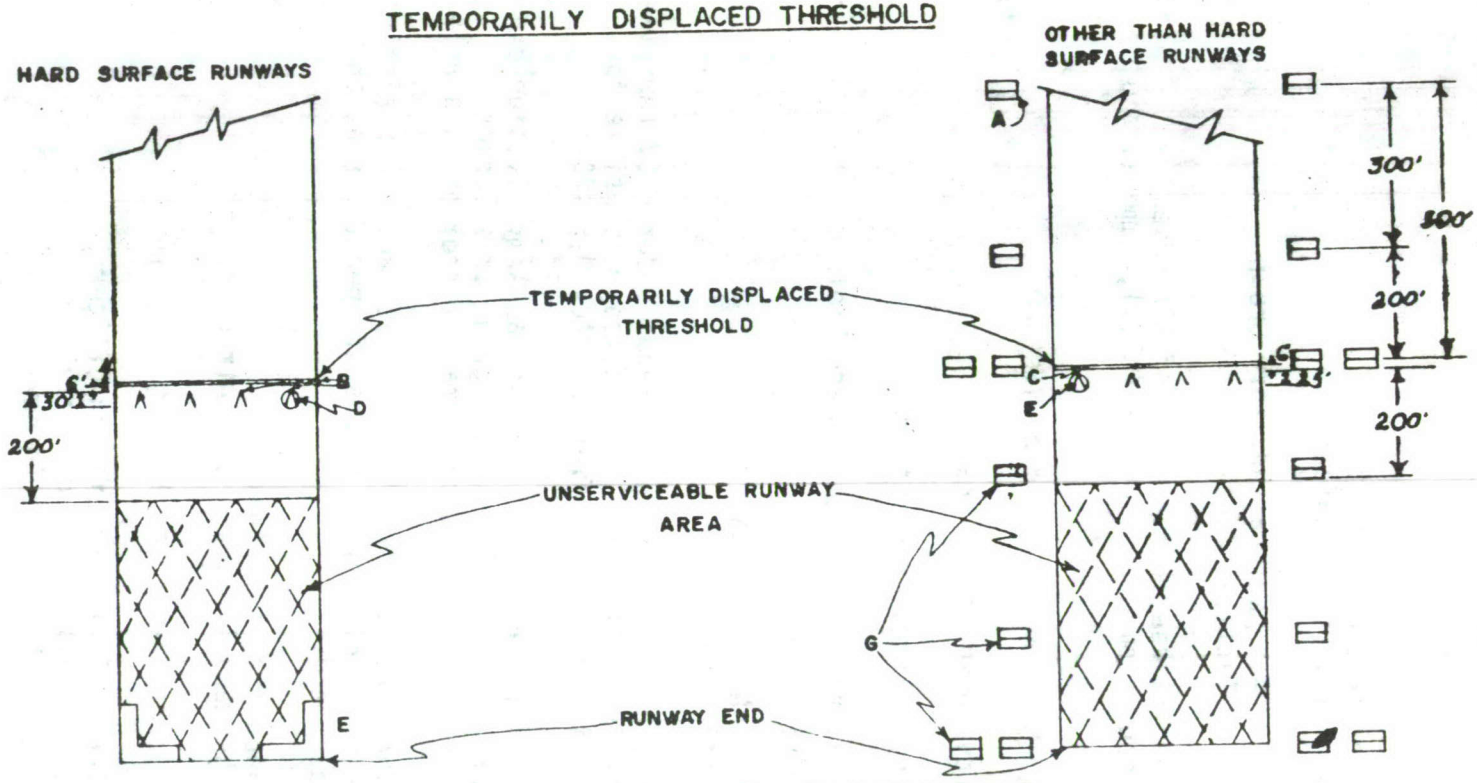
ANNEX F

RUNWAY MARKINGS AND LIGHTING

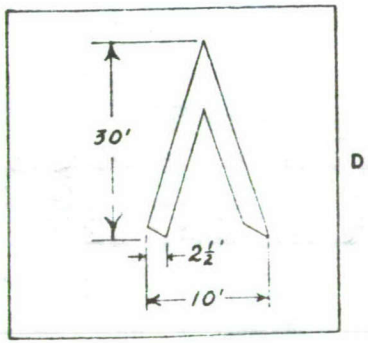
TYPE I, II C-123 AND C-7
(LENHGTH SHORTER THAN 2500')

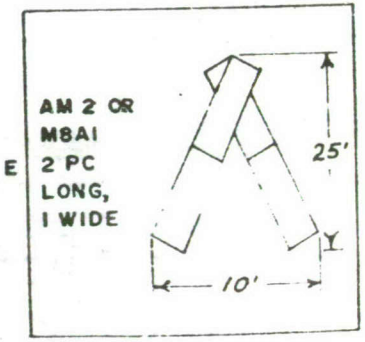


TEMPORARILY DISPLACED THRESHOLD



WHEN IT IS NECESSARY TEMPORARILY TO DISPLACE THE THRESHOLD FROM ITS NORMAL LOCATION ON THE RUNWAY DUE TO UNSERVICEABLE RUNWAY CONDITION, A CLEAR UNDERSHOOT DISTANCE OF 200 FEET SHOULD BE AVAILABLE BETWEEN THE UNSERVICEABLE AREA AND THE MARKING OF THE TEMPORARILY DISPLACED THRESHOLD.





A. 500 FOOT MARKER NOT REQUIRED FOR RUNWAY LESS THAN

B. WHITE PAINT

C. 2 PACE WIDTH WHITE PAINTED MATTING AM 2 OR M8AI

F. OBSCURE MARKINGS

G. ORIGINAL MARKES

C. E. SECURE MATTING TO SURFACE

MACV DIR 415-9

GLOSSARY

ALCC	Airlift Control Center
ALOC	Air Line of Communication
CAAG	Civil Aeronautical Advisory Group
CTZ	Corps Tactical Zone
DAB	(Vietnamese) Directorate of Air Bases
DCA	Deputy Commander for Air (MACV), same as the Commander, 7AF
FFV	(U.S. Army) Field Force Vietnam
GVN	Government of Vietnam
JAOG	Joint Air Operations Group
MACV	Military Assistance Command Vietnam
MAF	Marine Amphibious Force
NAVFORV	U.S. Naval Forces Vietnam
NOTAM	Notice to Airmen
Predominant User:	One of the component commands under MACV (Army, Navy, Marines, Air Force) designated responsible for activity at an airfield by MACV Dir 420-1.
Responsible Agency:	An Air Force wing or group, an Army division or brigade, or a Marine air group or squadron responsible for operational control of an airfield.
Responsible Officer:	The airfield commander, air commander, or airfield control officer in charge of operations at an airfield.
RVN	Republic of Vietnam
RVNAF	The Republic of Vietnam Air Force
STOL	Short takeoff and landing
TALO	Tactical Airlift Liaison Officer
TACP	Tactical Air Control Party
TMA	Traffic Management Agency
USAID	U.S. Agency for International Development
USARV	U.S. Army, Vietnam
VNAF	Air Force of the Republic of Vietnam
V/STOL	Vertical and/or Short Takeoff and Landing